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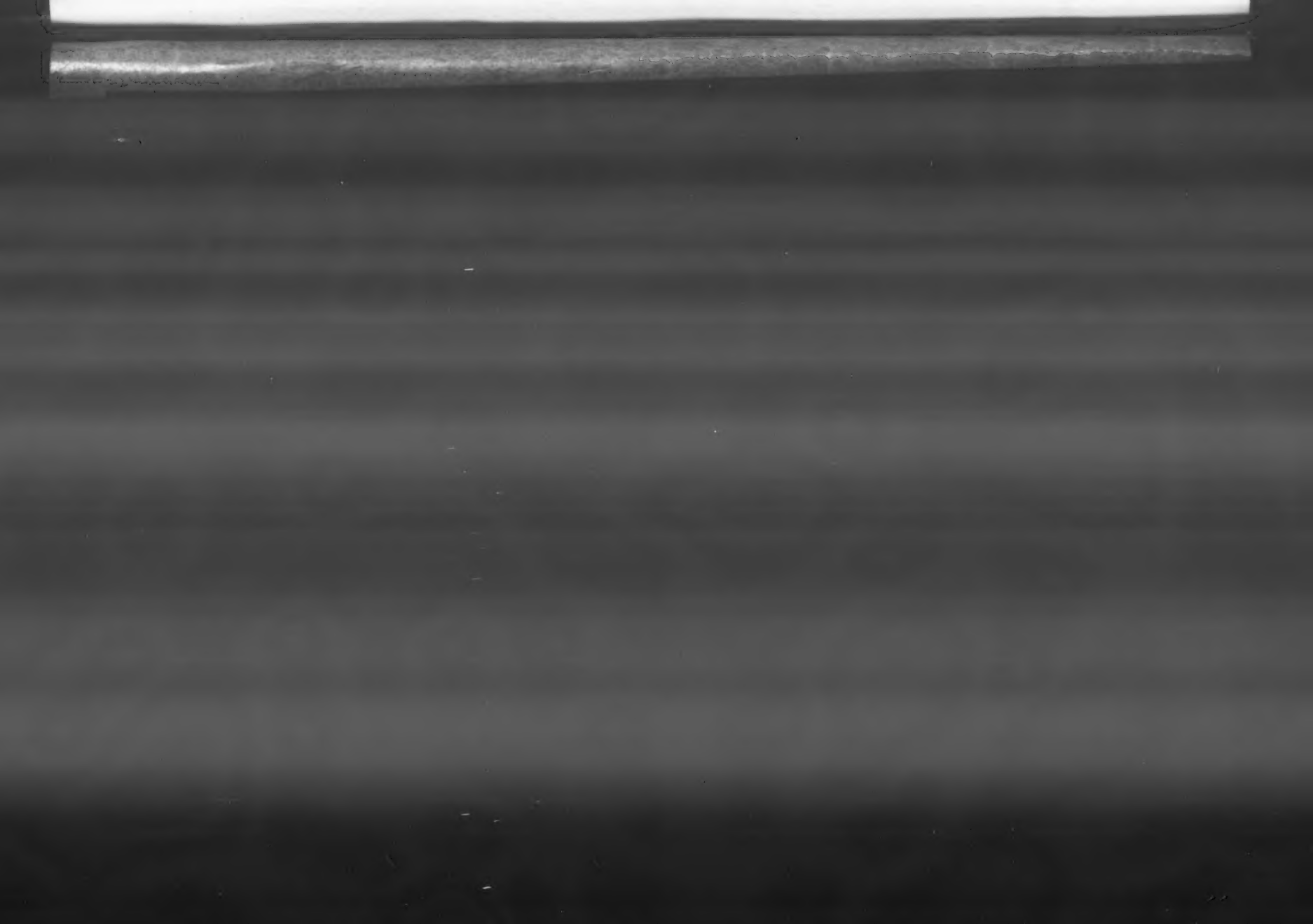


MUNICIPAL ENGINEERING.

VOLUME XXXVI. APRIL, NINETEEN HUNDRED NINE. NUMBER FOUR

STATE AID FOR ROAD BUILDING IN OHIO.

THE state of Ohio has a highway department, now about six years old, which was in the charge of Sam Huston as commissioner for about four years, and since his death has been under the efficient supervision of James C. Wonders, the present highway commissioner.

The law governing the department has been modified from time to time, usually by way of improvement, and further improvements are in contemplation as conditions will permit.

Roads are improved on order of the county commissioners and on petition of abutting land owners, and when more roads are applied for than can be constructed within the year, the county commissioners and the state commissioner make the selection. A further provision to be considered in the selection of roads to be improved under state aid is that the township trustees of the townships through which the road runs must agree to pay one-quarter of the cost of the road. The state commissioner may disapprove of any application.

A completed and approved application for improvement of a road, which has gone through the steps enumerated, places the road in the hands of the state commissioner, who plans the road and estimates its cost. Upon certification of this cost to the county commissioners they may adopt a resolution that the road be constructed, and procure the right of way necessary, if any. The state commissioner then lets the contract, and supervises the construction. When completed, the cost of the road is certified to the county commissioners, the township trustees and the abutting property owners, signifying the amounts to be paid by state, county, townships and abutting property under the act. At the beginning of the operation of the law it was provided that one-fourth the cost be paid by the state, one-half by the county in which the road lies, one-tenth by the townships in which the road lies, and fifteen per cent. by the abutting property according to the benefits thereto. Last year the state paid half the cost, provided it was not more than the $5,000 appropriated to the county in which the road was located.

Roads are improved in the order of filing of the completed and approved applications in case the state and county appropriations are not sufficient to pay their shares of all the roads applied for.

Such state highways are kept in repair by the county commissioners.

Bulletins have been issued by the State Highway Department from time to time giving instructions and forms of procedure for starting state construction of roads, and describing methods of construction and maintenance of county roads. Annual reports also contain instructions to engineers in charge of construction, and specifications for various forms of construction in use by the department, including macadam, brick and gravel. They also indicate changes in the proportions of the cost paid by the state, in the amount of appropriations by the state, and in the methods of apportionment of the appropriations among the counties of the state, and that still further changes are deemed desirable. So many experiments should result before long in a settled policy that will be equitable.

State money was expended for pike repairs in 1905 in 2 counties amounting to $227.26; in 1906, $54,545.28 in 32 counties; in 1907, $56,249.82 in 32 counties; in 1908, $230,000 in 46 counties. Each year these amounts were apportioned equally, being $1,704.54 per county in 1906 and 1907, and $5,000 per county in 1908. New construction in 1905 cost $233.09 in 5 counties; there was none in 1906; $53,815.12 in 1907 in 28 counties, and $30,394.54 in 1908 in 21 counties.

Last year the department let contracts for roads in nineteen counties, eight of brick and eleven of macadam, costing in all $256,186.13, of which the state assumed $93,528.18, and the counties and their subdivisions $162,-657.95. The appropriation being $5,000 to each county, fourteen counties raised in addition to their share under the law the difference between the state's proportion under the law and the $5,000 appropriated. Five counties restricted their payments to their share, which for last year was one-half the total cost.

The previous year three brick and twenty macadam roads were contracted for.

The number of counties making application for their apportionment of the state aid money for repair of roads instead of new construction was 46, so that $230,000 of the state aid money was expended for repairs under the direction of the county authorities.

Illustrations of some of the work of the department accompany, for which we are indebted to the state highway commissioner, Mr. J. C. Wonders. Some description of each road shown and statements of cost follow:

The first photograph shows a view of the Conneaut and Southern macadam road in Conneaut township, Ashtabula county. This road is 1.345 mile long, and is graded 22 feet wide. The macadam area is 14 feet wide and 9 inches thick. The maximum grade of the road was reduced from 7.5 feet per hundred to 6 feet per hundred. This required 4,635 cubic yards of excavation, costing 35 cents a cubic yard, or $1,622.25. The drain tile, at 5 cents a foot, cost $20, and the macadam required 3,681.5 cubic yards of stone, measured loose, at $2.90, or $10,676.35. This made the estimated cost $12,-318,60. The contract price was $12,-315.25. Expenses of supervision, etc., amounted to $653.20, making the total cost $12,968.45, or $9,641.96 a mile of 14-foot macadam roadway.

The second, third and fourth photographs show views of the Bethesda Southern macadam road in Goshen township, Belmont county. This road is 1.2 mile long, and is graded 18 feet wide. The macadam is 10 feet wide and 9 inches deep. Plate II shows the first course of stone in place, ready for rolling. Plate III shows the second course of stone before filling, and Plate IV shows a section of the completed road. The maximum grade, shown in Plate IV, was reduced from 13.4 feet per hundred to 8.74 feet per hundred. One section of this road required 7,217 cubic yards excavation, estimated at 30 cents, or $2,165.10. The macadam surface required 2,347 cubic yards of loose stone at $2.50, or $5,-867.50. This made the total estimated cost $8,032.60, there being no expenditure for drainage. The contract price was $8,032, and the expense for engineering, etc., was $473.20, making the total cost $8,505.20, or $7,087.66 a mile of 10-foot macadam roadway. A second section of this road of the same length required only 2,953 cubic yards of excavation at 30 cents, the engineering expense was slightly greater, and the cost of stone was $2.04 instead of $2.50 a cubic yard. The resulting cost per mile was only $5,174.54. This comparison shows that the cost of stone and the amount of excavation are both material elements in the total cost, and that it is not safe to compare the costs per mile of macadam roads without taking into account all the circumstances.

The Hayden Bridge road, in Perry township, Franklin county, shown in process of rolling in Plate V, is 14 feet wide and cost but $5,781.14 a mile, notwithstanding the amount of macadam is one-third greater than in the Bethesda Southern road, because the cost of the macadam is only $1.68 a cub yard, in place. This road also had $240 expense for drainage, and the cost of excavation was 40 cents a cubic yard, or one-third greater than in the preceding road.

The Frazeysburg road, in Falls township, Muskingum county, was made a brick pavement with concrete curb. It is 1.12 mile long, is graded 24 feet wide, and the brick pavement is 16 feet wide. It is shown in Plates VI and VIII.

The grade of the Frazeysburg road was reduced from 4.37 to 3.2 per cent. at an estimated cost of $484.85 at 25 cents a cubic yard. The gravel and sand foundation of the road, 2,351 cubic yards at $1.25, was estimated at $2,938.75. The concrete curb, 11,916 linear feet at 20 cents, was estimated at $2,383.20. The brick surface, rolled, filled, etc., 10,578 square yards at 75 cents, was estimated at $7,933.50. Drainage was expected to cost $200. This made the total estimated cost $13,940.30. The contract price was materially less than the estimate, viz., $12,925.20. As the final report of completion is not made, the expense is given only as estimated, viz., $557.61. If this figure is used, the total cost of the completed road will be $13,482.81, or $12,038.22 per mile of 16-foot brick roadway.

OHIO STATE ROADS.

I. Conneaut and Southern Macadam Road in Ashtabula County.

The Dalton road, in Sugar Creek township, Wayne county, shown in Plate VII, is 1.02 mile long, is graded 24 feet wide, and has a brick roadway 14 feet wide. The maximum gradient of this road was reduced from 2.84 to 2.71 per cent., and the estimated cost of grading at 25 cents a cubic yard was $699. The broken stone foundation at 29 cents a square yard amounted to $2,429.23, the concrete curb, 5 by 16 inches, at 20 cents a linear foot, amounted to $2,159.60. The crushed stone backing at $1.45 a cubic yard amounted to $578.55. The brick surface, laid complete at 83 cents a square yard amounted to $6,952.91, making the total estimated cost of the road $12,819.39. The contract price was somewhat less than the estimate, being $11,990.45. If to this is added the estimated expense, $640.97, the total cost of the road will be $12,631.42, or $12,383.74 per mile of 14-foot brick roadway.

Plate IX shows the brick surface of Muskingum Avenue road in Muskingum township, Washington county, laid, but not yet filled, rolled and finished. This road is 0.79 mile long, is graded 24 feet wide, and the brick paving is 16 feet wide. The estimated cost is made up as follows: Excavation at 25 cents a cubic yard, $706.25; gravel and sand foundation at 22 cents a square yard, $1,639; concrete curb, 5 by 16 inches, at 22 cents, $1,830.84; gravel backing of curb, 8 by 24 inches, at $1.20 a cubic yard, $492; brick surface laid complete at 75 cents, $5,587.50. This makes the total estimate $10,255.59, and the contract price was $10,193.94. Adding the estimated engineering expense, $615.34, the total cost will be $10,809.28, or $13,682.50 a mile.

These figures on brick pavements again show the necessity of considering the cost of details when comparing the cost of roadways in various localities.

WATER RATES.*

By Frank C. Jordan, Indianapolis, Ind.

I HAVE taken occasion to read some seventy articles on the subject of water rates written by various men prominent in the water works line, that contain about seventy different ideas of what constitutes a fair water rate. I believe, therefore, that I am at liberty to attempt an additional solution.

The first and most important requisite is the supply of water, and it is necessary that a water company, whether it be municipal or private, shall have good machinery, an adequate distribution system, and an abundant supply of water, whether that comes from wells or from filter beds, and that these three mentioned requisites shall be of such size as to furnish at all times an efficient supply of pure water, both for private and public use, and then rates sufficient to maintain at all times that efficient supply should be set by the authorities and collected by the company, whether it be a municipal or a private institution.

It so happens that in most of the cities throughout the country the rate is looked upon as the paramount issue, and very often an entire campaign is fought out and a party is elected simply on a proposition of a reduction in water rates. It is needless for me to mention specific cases. I believe, however, that the most striking example of this kind is that found in the city of Chicago, where the rates from time to time have been reduced until at the present time the revenue of the water plant is not sufficient to provide a suitable supply of water and to keep up the plant in good condition, and we find the water department is compelled to revert to the tax budget for approximately $1,000,000 a year with which to make certain necessary repairs. I am informed that even this amount is not sufficient to take care of the necessary extensions and new construction, and that these two items will have to be taken care of by additional appropriations from the tax budget.

Our courts of equity are continually called upon to decide what constitutes a fair water rate, and scarcely a week passes in which we do not notice in some issue of the engineering or water works papers some court decision in which the court of equity has held that the rates established by councils or other governing bodies must be fair

*From a paper before the Indiana Sanitary and Water Supply Association.

OHIO STATE ROADS.

II. Bethesda Southern Road in Belmont County. First Course Ready for Rolling.

rates, fair both to the consumer and to the company. It is extremely difficult to get the people generally to take into account the various local conditions which make the rate in one town necessarily higher than the rate in some other nearby town.

Throughout the country there is now a general tendency toward increasing rates, in order that the municipal and private companies may procure better supplies of water, and people are now beginning to look at this matter in a somewhat different light than they did a few years ago. When a citizen goes to his bath tub and opens the faucet, and there trickles forth a weak stream about the color of coffee, he realizes that it is poor consolation to reflect on the fact that the rates charged by the water department in his town happen to be somewhat less than those charged in some neighboring city.

During the year just past I had the pleasure of gathering statistics and statements from practically every city of any size throughout the United States, and I can assure you that some of the schedules would be ludicrous were it not for the fact that in their operation they become a serious problem to the works most interested.

Recently I had occasion to take some little interest in a small plant in one of our western cities. Much to my surprise, I found that their contract prevented them from charging any higher rates than the average rate charged by four cities, two of which happened to have municipal plants and two had private plants. The attorney for the city attempted to hold that the rates charged for water in the towns operated under municipal ownership were simply those shown in their published schedules, although the authorities of the municipal department in these two towns informed the writer that if all the charges, such as interest on outstanding bonds, reasonable credit for money invested, and other like items, were considered, their rates would be almost double those shown in their schedules. In arriving at a reasonable rate for a town, the average charge by certain other towns throughout the state should not be the basis for establishing a rate for any town, but the necessary cost of a plant to furnish an efficient supply at all

times should be considered, and then a rate should be made sufficient to cover expenses of the service, a reasonable profit on the amount invested, and a reasonable amount to take care of unforeseen accidents or conditions.

Doubtless it will be of some interest to you to hear some of the averages as shown in the tabulation made up by the writer. Throughout the United States the average rate for family use for a house of six rooms, with hot and cold water in the kitchen, is $6.28; add to this hot and cold water for the bath and for a lavatory, and also water for wash tray and water closet, and the average is $13.49; adding to this water for sprinkling for an average size lot, and that happens to be forty feet, the average rate is $18.43. The average maximum rate charged for water furnished by meter per thousand gallons is 22 cents, and the average minimum rate is 9 cents. Throughout the state of Indiana these rates are somewhat less, being $5.45 for house service, $13.57 for house service, bath, water closet, etc., and $18.19 for house service, bath, water closet and sprinkler.

The record made up from the cards returned by the officials is notable as to filtration of water. Throughout the United States the records show that only 24 per cent. of the municipal plants are furnishing filtered water, while 57 per cent. of the privately owned plants are furnishing filtered supplies. This situation arises owing to the desire of the municipal departments to reduce water rates, so that there is not sufficient money at the command of the water department to install a filtration system.

From Columbus, Ohio, Louisville,

OHIO STATE ROADS.

III. Bethesda Southern Road in Belmont County. Second Course of Stone Before Rolling.

OHIO STATE ROADS.

IV. Bethesda Southern Road in Belmont County. Completed Macadam Roadway.

Ky., St. Paul. Minn., Kansas City, Mo., and from many other cities throughout the United States we are receiving information that they are contemplating or have already put into effect a considerable increase in their water rates, in order that they may procure better supplies of water. I firmly believe that before long the proposition of the "free list" in most of our cities will practically be eliminated, and every public building and public institution, as well as every private building and private institution, will pay its proper share for water.

The average plant throughout the country was, during the past season, face to face with a great problem in the procuring of a sufficient supply, and we all to-day realize that it is necessary to incur heavy expense in order to conserve the supply of water, that we may have sufficient supply to carry us through the prolonged dry spells, such as we have passed through during the past summer.

On the cards which I sent out was the question, "What percentage of your total pumpage is furnished free to the city?" and the surprising development came out that some of the cities furnish as high as 30 per cent. of their total pumpage to the city for public buildings, parks, etc. On further inquiry I found that in most of the cases it was a matter of waste, and we are aware that the only way to stop this waste would be to have it understood that each department is to be charged for the water used, and speedily we will see that waste cut down, and then the rates to other consumers throughout the city can be correspondingly reduced.

Any one who goes into the question carefully will doubtless be surprised to notice the various rates charged for hydrant rentals in the cities throughout the country. What is supposed to be a fair hydrant rental varies in the cities throughout the country all the way from $8 per hydrant to as high a figure as $79, and the various tabulations as published by different water works men show that the average rate is approximately $47. In a recent decision of the court we find that a reasonable hydrant rental for the city of Omaha was declared to be $60 per year for each hydrant, and the city at this time is paying that rental. I am of the opnion that the important item is not

especially the rate of the hydrant, but the important point is to have good hydrants, well located, well taken care of, and to have water at the hydrant of sufficient pressure to take care of the ordinary fire. It is useless to compare the rate charged for a hydrant furnishing service such as that furnished in Chicago with the rate charged for a hydrant furnishing service such as that furnished in Terre Haute or in Richmond. In the last two named towns the fire department depends almost entirely on the hydrant pressure to put out most of the fires, and the fire department in our own city of Indianapolis informs the writer that during the last year 97 per cent. of the fires were put out entirely without the aid of the steam engines. In the cities furnishing service like that furnished in the city of Chicago or the city of Detroit no dependence whatever is placed on hydrant pressure, but an expensive fire department is kept up, and engines respond to every fire, and they are depended on entirely in the fighting of all fires.

In further reference to the matter of placing the hydrants, although not directly connected with the question of rates, you doubtless noticed the article which was laid on our desks some few days ago by an eastern manufacturer. On this leaflet we were informed that at the Chelsea, Mass., fire the pressure at the end of 900 feet of 2½-inch hose was 47 pounds, while the pressure at the engine was 140 pounds, showing a loss of 93 pounds in the 900 feet of hose. Doubtless this particular hose was badly tangled, but we notice at each fire like conditions, and this simply calls to mind the importance of having fire hydrants close together, so that short lines of hose can be used. The tabulation shows that throughout the United States there is on an average one fire hydrant to every 555 feet of mains, and the general tendency at this time is to locate hydrants closer together, especially in what is known as the congested district of the town.

The tabulation of rates has been a work of considerable interest, but its chief value to the writer has been to show the great importance of a careful consideration of the existing local conditions before the establishment of water rates.

TUNGSTEN LAMPS COMPARED WITH ARC LAMPS.

By Alton D. Adams, Worcester, Mass.

STREET lighting can be done at lower cost with tungsten incandescent lamps than with either the direct current or the alternating enclosed arc, and substitution of the tungsten lamps involves only slight increase of investment. It follows that these arc lamps should be discarded.

These conclusions apply with the most force to the great majority of streets, where only a moderate illumination is wanted, but they are also true where a higher degree of illumination is required.

Because of the high efficiency of the tungsten lamps, a greater illumination may be had at the same cost, or an equivalent illumination may be had at less cost than with the arc lamps named.

Take, for example, the arc most commonly used on the streets, an enclosed lamp operated with 6.6 amperes alternating current, and sometimes fictitiously designated as of 1,200 candle-power. This lamp operates with 400 or more watts, and gives usually not more than 400 maximum candle-power, while its mean hemispherical candle-power is less than 300.

The tungsten series lamps for street lighting are regularly made in sizes rated at 32, 40 and 60 candle-power, and operating with 40, 50 and 75 watts, respectively. Maximum candle-powers for these lamps, with reflectors, are about 25 per cent. greater than the above rated candle-powers, and so amount to one candle per watt consumed, and these maximum candle-powers occur between 20 and 30 degrees below the horizontal.

When comparing illumination close to the lamps, it is sufficiently favorable to the alternating enclosed arc to consider its mean spherical candle-power along with the rated candle-power of the tungsten incandescent lamps. As this alternating arc requires at least 400 watts, it appears that 10 of the 32 candle-power, or 8 of the 40 candle-power, or 5.3 of the 60 candle-power tungsten lamps operate with an equal amount of power.

As against the less than 300 mean spherical candle-power for the alter-

OHIO STATE ROADS.

V. Hayden Bridge Road in Franklin County. Rolling Macadam.

nating arc, ten of the 32 candle-power tungsten lamps have a rating of 320 candles, eight of the 40 candle-power have also a rating of 320 candles, and five of the 60 candle-power have a rating of 300 candles.

If illumination at the lamps is to be the test, the tungsten lamps are the superior to the alternating arcs.

But in street lighting there is always more illumination than is necessary at the lamps, and the test, whether much or little light is wanted, is the illumination midway between the lamps. On this test the superior economy of the tungsten lamps is very marked.

If a high degree of illumination is wanted, as along the business streets of a large city, the alternating arcs may be spaced 100 feet apart, and will then give about 0.15 candle-foot at points midway between lamps. Five of the 60 candle-power tungsten lamps consume only 375 watts, instead of the 400 watts taken by the alternating arc, but these five tungsten lamps spaced 20 feet apart, so as to light 100 feet along the street, give 0.75 candle-foot at points midway between the lamps, or five times the illumination got from the alternating arc.

If only three of the 60 candle-power tungsten lamps are used to replace one alternating arc, along 100 feet of street, the illumination at points midway between the tungsten lamps is 0.18 candle-foot, or 20 per cent. more than that for the arc, and the watts required by these three lamps are 225, or little more than one-half the power consumed by the arc lamp.

On most side streets an illumination of 0.03 candle-foot is sufficient, and this may be obtained by the 400 watt alternating arc lamps spaced 220 feet apart, so that five of these lamps, consuming 2,000 watts, will light 1,100 feet of street.

An equal illumination of 0.03 candle-foot, at points midway between the 60 candle-power tungsten lamps, may be obtained by spacing these lamps 100 feet apart, so that eleven are required to light 1,100 feet of streets. The power required for these eleven tungsten lamps is 825 watts, or only 41 per cent. of the power for the five alternating arcs to light the same length of street.

The substitution of tungsten incandescent lamps for either the open or the enclosed arcs involves only a small increase of investment in electric equipment, and after the change is made the operating expenses will be lower than before for an equivalent illumination.

At the generating station little, if any, change of equipment will be necessary. The old open arc lamps usually operate with 6.8 amperes for the so-called 1,200 candle-power type, and 9.6 amperes for the so-called 2,000 candle-power. Series alternating arcs are regularly used in two sizes that operate with 6.6 amperes and 7.5 amperes, respectively.

For the open arc lamps the energy is generated by constant current dynamos, giving either 6.8 or 9.6 amperes. The alternating enclosed arcs are operated by constant current transformers that deliver either 6.6 amperes or 7.5 amperes. By means of their regulating mechanisms, with no reconstruction whatever, both the constant current dynamos and the constant current transformers can be adjusted to deliver currents materially less than those just named, in a satisfactory way.

Series tungsten lamps operate with either direct or alternating current, and so may be connected to either the direct constant current dynamos now used with open arc lamps, or to the constant current transformers.

Tungsten lamps of 32, 40 and 60 candle-power are regularly made to operate with a current of 6.6 amperes, and either of these sizes may thus be connected to either 6.8 ampere dynamos or to 6.6 ampere transformers.

In the 40 and 60 candle-power sizes of tungsten lamps one of the regular ampere ratings is 7.5, and lamps of this rating may have their current increased up to 8 amperes. For the operation of either the 40 or the 60 candle-power lamp, therefore, either a 7.5 ampere transformer may be used without adjustment, or a 9.6 ampere dynamo may be regulated to deliver 8 amperes to the lamps.

Where either of the plans just named can be carried out, the substitution of series tungsten lamps for series arcs on the streets will entail no expense whatever at the electric station. In the matter of poles and line wire the same is true, except that a few additional poles may be required to support some of the tungsten lamps, and a moderate amount of labor and wire will be necessary to carry the line connections down to these lamps.

In general, the same circuits that have been used for the arcs will be available for the tungsten lamps.

The arc lamps and their special supports, such as mast arms, if any, will

OHIO STATE ROADS.

VI. Brick Road. Laying Curb on Frazeysburg Road in Muskingum County.

have something more than a scrap value, and this will go to partly or entirely offset the items of expense just named.

Coming to the tungsten lamps and their special supports, each lamp must have a socket, reflector and bracket. The lamps themselves are more properly charged as an operating expense than as a construction or capital item, because they are renewed from time to time, like the carbons for arc lamps.

Tungsten lamps of either 32, 40 or 60 candle-power, in the type designed to operate with 6.6 to 8 amperes, cost $1.75 each, list, with a discount of 10 per cent. in packages of 50 lamps. For larger numbers of lamps the prices are slightly less.

According to the best available data, these tungsten lamps for series connection have an average life of 1,000 hours, with only a small decrease of candle-power, so that the cost per lamp hour, at the 10 per cent. discount, is 0.1575 cent for the lamp alone. For all-night lighting during a year with 4,000 hours of operation, the cost per tungsten lamp, for lamp renewals, will thus be $6.30, and for half-night lighting on every night during, say, 2,600 hours, the cost per lamp, for lamp renewals, will be $4.09 per year.

It is thus important to note the advantage of using the 60 candle-power size rather than the 32 or 40 candle tungsten lamp, since about 5 of the 60 candle, 8 of the 40 candle, and 10 of the 32 candle size consume a power equal to that for one 6.6 ampere enclosed alternating arc. As these lamps are of equal cost, without regard to candle-power, the expense of renewals during 4,000 hours of service, for lamps taking power equal to that of the alternating arc, will be $63 for the ten lamps of 32 candle-power each, $50.40 for the eight lamps of 40 candle-power each, and $31.50 for the five lamps of 60 candle-power each. For half-night lighting with 2,600 hours of yearly operation, the renewal expenses of the tungsten lamps will be only 65 per cent. of those just stated for 4,000 hours of service.

The cost of trimming and cleaning the alternating enclosed arc lamp during a year of 4,000 hours will be about $3.50, with good carbons, so that, if five tungsten lamps of 60 candle-power each replace one alternating arc, the renewal expense on these tungsten

lamps during the 4,000 hours of operation will be $28 greater than the cost of trimming and cleaning the arc.

If the rate charged for the service of the alternating arc was $80 per year, then, to yield the same profit over expenses, the five substituted tungsten lamps, operating with a little less power, should be charged for at not more than $80 plus $28, or $108, for 4,000 hours of service. This amounts to $21.60 per year, or 2.7 cents per lamp-hour, for each tungsten lamp of 60 candle-power.

But, as shown above, the alternating enclosed arc may be replaced, with advantage as to illumination, by only three of the 60 candle tungsten lamps, and these three lamps, at the rate of $21.60 for 4,000 hours of service, represent an outlay for street lighting of $64.80, as against the $80 assumed to have been paid for the arc service.

The socket, reflector and bracket for each tungsten lamp can be erected complete at a cost of $4, and if 10 per cent. of this sum, or 40 cents, for interest, repairs and depreciation, be added to the $21.60 found above for the rate of a 60 candle-power tungsten lamp during a year of 4,000 hours' service, this rate becomes $22.

In place of the alternating arc, assumed to cost the city $80, the three tungsten lamps of 60 candle-power each, giving a better illumination than the arc, should cost $66, at the same energy rate.

PLANNING THE CLINTON SEWERS.*

By C. P. Chase, City Engineer, Clinton, Iowa.

COMPLETE topographical surveys were made of the whole corporation according to the program for collecting data, and these were recorded in note books and marked on maps. These consisted of levels on all city streets, and out to the dividing lines of all drainage areas, and out to low water line in the river in many places, showing the total number of acres draining through the corporation, and these surveys were tied in with surveys made for the United States government by myself some time previously, showing the character of our river front, main channel of the river, and direction of the currents. The survey also took in all existing sewers and also rock soundings in a large portion of the city.

To a great extent water and gas pipes were located, but it was found that they had been so irregularly placed that the sewer lines could not be so located as to avoid them in all cases. The character of the soil was also examined as to its capacity for absorbing water, and a record of rainfall was obtained for the past thirty years, to calculate the average heavy storm. All plans of previous sewers were examined, but were found to be of limited scope. After all local data were complete, special trips were made to St. Paul, Minneapolis, La Crosse, Dubuque, Winona, Davenport, Muscatine, Burlington, St. Louis, Memphis, Vicksburg and New Orleans, the situations in these cities being the nearest that in Clinton. In addition to these, examination was made of notable work in the eastern part of the United States, and through Mr. Cox examination and report was made of leading sewer systems of Europe. In nearly all cases photographs, plans and reports were obtained, and many valuable points gathered from engineers in charge; all of which were compiled, carefully examined, and compared with twenty-three smaller systems we had previously planned before the actual designing of this system was commenced.

In selecting the streets on which the sewers were to run, attention was paid to the natural fall of the ground as much as possible, but at the same time avoiding the unnecessary crossing of private property. It is much more satisfactory to have the sewers constructed on the streets and alleys or public highways, even at a considerably greater depth and expense, than to follow the natural slope of the ground through private property. When sewers are built on the public thoroughfares, there can be no question regarding easements and no extra cost or delays on account of the right of way, or lawsuits pertaining thereto.

In determining the size of storm sewers, the following were the principal elements considered: The number of acres included in the drainage area, amount of rainfall, character of the

*From a paper before the Iowa Society of Engineers.

OHIO STATE ROADS.

VII. Brick Road. Concrete Curb Completed. Broken Stone Foundation in Place. Dalton Road in Wayne County.

soil, the amount of slope in the surface of the ground, and the distance from the outlet. The various parts of the city of Clinton showed different results as to amount of water absorbed by soil. Flat stretches of sandy soil took up nearly all the water that fell during a storm of several hours, and the level bottom lands also absorb much of the moisture that falls on them, but the clay hills throw off rapidly nearly all the water that falls.

In the case of Clinton the amount of rainfall to be expected was taken from an average of the record as shown by the United States Government self-registering gauges, in Des Moines, St. Paul, St. Louis and Springfield, Ill., and the local record as shown by the rain gauge of Mr. Roberts, the local observer, for the past thirty years.

These statistics show that in the time required for water from the head of the water-shed to reach the river the average heaviest storm would be two inches per hour, and for periods of ten minutes to thirty minutes the rainfall reaching the head ends would be heavier. The record of these storms was platted and a rain curve constructed and on this as a basis with fifteen minute ordinates the sizes were computed and are so proportioned as to be ample for all ordinary heavy storms, the various sizes being calculated so that short violent storms will be quickly carried off, with a much larger allowance at the upper ends near the hills, than on the low flat stretches. All sizes are computed on a basis of running half full and on the theory of one-half reaching the con-

duit, which condition will probably be good for fifty years to come, possibly more.

The grades used are in all cases sufficient to give self-cleaning velocity in the largest sewers and waterways. A change in the shape of some of the mains was made from circular, as first contemplated, to a comparatively flat bottomed arch with a 24-inch channel below the general line of the bottom in the center. This gives a greater velocity for the dry weather flow, which is quite small, and carries the great volume of sewage at a lower level, which in Clinton is a very important consideration in bringing in the side lines. We note that practically the same idea has been adopted in the City of Mexico and in New Orleans. In all small pipe lines and sanitary sewers the grade of the pipes has been so arranged that the crown of the upstream pipe is above the crown of the down-stream pipe, thus giving a better circulation of air, preventing the backing of the air currents by the stronger current of the main sewer. The grades of outlet sewers wherever possible have been kept enough above the level of the river to operate by gravity, without having to resort to pumping.

The depth of sewers will be everywhere ample when the streets are put to grade. As a rule the sewers will run from 9 to 11 feet below grade in the business districts and from 7 to 10 feet below grade in the residence district.

Manholes are to be placed at every change in grade or direction, and for the purpose of cleaning and inspection, at intervals varying with the size and grade of the sewer. These are to be of brick on all brick and pipe sewers and of concrete on concrete sewers.

Flushtanks are placed at the head end of all low grade laterals, using 6-inch syphons. In providing for ventilation, manhole covers are perforated, the crowns of the sewers are on an an even level, and in the house plumbing the ventilation pipes are to be carried above the roof. Brick were hard burned arch brick laid in Portland cement mortar and plastered with same. Cement was tested for tensile strength and action in water. All wearing surfaces, tongues, curves, etc., in manholes or other places to be plastered over with Portland cement.

The pipe for pipe sewers was specified to be burned till vitrified, not simply a glaze on the outside, but a tough burn clear through. Concrete was one part Portland cement to six parts gravel and sand with a facing of cement and sand, later a one to five wet mixture was mostly used. On concrete sewers the manholes are all concrete, on brick and pipe sewers, brick.

In District No. 4, which was the most difficult, many interesting problems arose. The territory being so level and forming as it does a basin that receives the discharge of about 700 acres of hill country, it is seen that the difference in the dry weather and storm flow is enormous. Also, in order to avoid continuous pumping the end had to be kept up, while it was equally imperative to have line of flow low enough to allow of some twelve miles of branches, in a district almost entirely of the same level. The rock soundings also showed that nearly all the main line would be in rock excavation, so that no extra foundation or cradling was necessary and lighter side walls could be used. On estimating the cost of brick and concrete under these condtions it was found a large saving could be made with concrete. Having the foregoing in view it was decided to adopt a flat-bottomed arch of reinforced concrete on the main line for all sizes between 4 to 10 feet. The reinforcement used was ten gauge ten pound expanded metal on the larger sections and seven pound on the smaller. No reinforcement was used in sizes smaller than four feet. In the bottom of the conduit a channel was formed in the concrete sufficient to carry the dry weather flow running from 24 inches to 12 inches. This channel proved extremely useful during construction for drainage purposes and to keep the grades. Steel pans or troughs about 12 feet long were made of just the size of the dry weather channels on each size. These were set to exact grade in a cross form every six feet, which supported the steel pan. The concrete was then placed from sides and brought in to the pans, in such a manner that any surplus water, etc., was carried and crowded ahead of the concrete to the end of the section and then ran down the inside of the steel pans without washing, or, in fact, touching any work less than several weeks old. The trough with planks laid on the steel cross bands also served as a runway for the men and working platform without touching the concrete.

The first draft of the plans was completed in 1903, and two small mains were constructed in Districts 9 and 11 under the supervision of the writer, but as there were no unusual

OHIO STATE ROADS.

VIII. Brick Road. Laying Brick Pavement on Gravel and Sand Foundation. Frazeysburg Road in Muskingum County.

features of interest aside from a low first cost this is the only point that will be touched on. In one case on Pearl street the sewer was construtced of one layer of hard burned brick laid in Portland cement mortar at a cost of $1.83 per foot for 24 inches by 36 inches, and $1.764 for 22 inches by 33 inches on Park street. The cost of the one ring 28x42 was $1.90, but this form of construction, while extremely economical, can only be used where the conditions are just right. On Pearl street the sewer cradled in soft limestone rock in a hard clay; all these conditions had been ascertained before the plans were made and it has been the aim all through to adapt the design to the natural condition, with the result that we believe our clients have been saved at least 10 per cent. in cost over ordinary methods.

THE CONSTRUCTION OF AN ASPHALT STREET.*

By Isaac Van Trump, Asphalt Chemist, Chicago, Ill.

PROCEEDING now to the street, the scene of the actual operation of building the pavement, the contractor, by either filling or cutting, brings the surface of the subgrade to the proper distance below the surface of the asphalt pavement as it will be when finished.

Best results appear to be obtained when the subgrade is composed of sandy soil. It is always firm and stable and any trenches or holes can be quickly and firmly settled with water.

Clay or other heavy soils are more or less unsatisfactory, as all trenches and soft spots must be removed and

*From an address at the University of Notre Dame, Ind.

replaced with firm earth and tamped in layers.

Swampy or marshy soils usually cause a great amount of trouble, especially in cold climates, and precautionary measures should be taken by laying an extra strong concrete base to bridge over soft spots not thoroughly compacted.

All subsoils, regardless of charfacter, should be thoroughly compacted with a heavy roller. A three-wheeled roller weighing about thirteen tons is customarily used for this purpose rather than the regular two-wheeled asphalt roller, as one of the wheels of the former will surely locate any soft spot or trench which a tandem roller might straddle.

Proper and complete drainage is very essential, particularly in cold climates. In Manitoba, Canada, where the soil is extremely marshy, cracks six inches in width frequently appear in the subbase, causing corresponding cracks to appear in the concrete foundation, which will in turn be transmitted to the asphalt surface. These latter cracks have been successfully prevented by placing in the subgrade, at intervals of 25 or 30 feet, 6-inch trenches filled with broken stone, these trenches extending the entire width of the street and connecting with similar trenches under the curb, which in turn connect with catch-basins for the removal of water. With this form of construction there is also spread between the subbase and the concrete foundation a layer of clean sand or gravel, rolled to the depth of 3 inches. Tile drain pipes have been tried, but are found to freeze and burst.

The base or foundation for the pavement is in numerous forms. Bituminous base is made with 6 inches of broken stone, rolled and sprinkled with tar or asphalt cement. It contains a large amount of voids which are the cause of instability in the base, thus resulting in lack of support for the surface, and, consequently, are the cause of the large cost of maintenance. It is also quite costly in other respects, as a large quantity of the loose stone is pushed down into the subsoil by the roller and lost.

Old macadam contains less voids and is generally more satisfactory than bituminous base. Old cobble, asphalt block or granite block streets make very satisfactory foundations, if not reset. The granite blocks, if laid on a concrete base or grouted with Portland cement if reset, make a very rigid foundation. Old brick streets make an excellent base if not reset, and many brick streets will undoubtedly be resurfaced with asphalt in the future.

Hydraulic cement concrete is the best form of foundation for all kinds of traffic and is the only form to use for streets of heavy traffic.

For ordinary requirements met with in the average American city, satisfactory concrete can be produced with the folowing proportions:

Portland cement	1 part
Coarse sand	3 parts
Stone	6 parts

Use sufficient water to have concrete wet rather than dry.

Six inches of concrete made with these proportions is usually sufficient, although in exceptional cases, where the subbase is bad or the traffic unusually heavy, seven or eight inches is advisable.

The purpose of the coarse sand or gravel is to fill the voids in the stone, making a more compact mass and thus keeping out water and gas. Loam in the gravel is not injurious to the concrete if not lumpy.

Limestone screenings can be substituted for the sand or gravel and has been demonstrated to produce a stronger concrete than when the atter is used. It has proven desirable in many places, the most notable of which being the Buffalo breakwater, the Manchester and Liverpool (England) water works, the Jerome Park reservoir, the masonry construction on the C., M. & St. P. R. R., in the concrete of the water power sections Nos. 1, 2 and 3 of the Chicago Drainage Canal, etc.

Mr. Clifford Richardson, who is almost universally recognized as the highest authority on asphalt pavements in particular and road making in general, and with whom I have been associated in business for nearly ten years, stated, as a witness before the Aqueduct Commissioners of New York City, that the particles of crusher screenings are better graded in size, thus having a smaller volume of voids and permitting a definte volume of Portland cement to go farther toward filling these voids than with sand where the particles are more uniform in size and the volume of voids large.

It is advantageous for the concrete base to be rough rather than smooth, as the rough surface provides an anchorage for the binder, thus preventing the binder and surface from creeping under traffic during the warm weather.

Upon this foundation of concrete the binder course is laid to the thickness

OHIO STATE ROADS.

IX. Brick Road, Before Completion. Muskingum Avenue Road in Washington County.

prescribed by the specifications; usually 1 or 1½ inches. The binder is spread by means of hot iron rakes, after which it is compressed by a roller, usually one weighing about five tons. It is not the object of this binder to form a perfect bond between the concrete and the wearing surface, as some persons wrongly believe, but to unite with and support the surface to prevent it from slipping or creeping on the concrete. Acting as a support for the wearing surface, it is essential that the stone (preferaby crusher run to pass through a one-inch ring) should be so strong that it will not crush under the weight of traffic during the hot weather when the surface mixture is softened by the heat.

In some instances, the binder course can be omitted entirely, using an asphaltic paint coat instead. This form of construction can be followed to advantage when resurfacing old brick streets. The brick surface should be thoroughly cleaned with wire brushes and be free of moisture. The paint is made with approximately 8 parts of asphalt cement of about 50 penetration and 10 parts of 62 degree benzine. It can be made either at the paving plant and hauled to the street in barrels or be mixed as needed at the scene of the operation. When ready for use it should be in liquid form and can be applied to the brick surface with brush or squegee, and, after the benzine has evaporated, a film of sticky asphaltic paint remains, forming a complete bond between the wearing surface, which is laid immediately the benzine is evaporated, and the brick. This bond is so strong that the bricks will frequently break rather than the bond between the topping and the bricks, when holes are afterward cut for the laying of pipes, etc.

Returning to the customary form of construction: On the binder course is laid the hot asphaltic surface mixture, which is hauled to the street in covered wagons at a temperature of about 315 degrees F. It should be dumped on the binder at a sufficient distance ahead of the material already raked to permit the entire load to be shoveled without making it necessary for the workmen to step in it. It is spread by means of hot iron rakes to the desired thickness, usually 1½ or 2 inches, after which it receives its initial compression with a five-ton tandem rol-

ler. A thin coat of hydraulic cement is then swept over the surface, after which it receives its final compression with a ten-ton roller, rolling being continued until no further marks are shown by the rolls. The street is then barricaded until the wearing surface is entirely cool, five to ten hours being required, depending upon he weather.

SUNSET BOULEVARD IN LOS ANGELES.

By Edgar Percival, Los Angeles, Cal.

WITHIN the city limits of Los Angeles, Cal., there will shortly be under construction a work of great import in the development of the city's characteristic beauty. It will be the largest single highway improvement in the history of this city, and establish the grade of Sunset boulevard from Marion avenue to the west city limits, a distance of over three miles. The improvement will cost between $225,000 and $250,000.

For more than nine months City Engineer Homer Hamlin, H. Z. Osborne, Jr., office engineer, and H. P. Drake and Jesse Wright, assistants, have been making the plans for this improvement. The result of their work is an ordinance which will contain ten thousand words, the greatest number in a description under the Vrooman act and will fill a page of a newspaper. The contract also will be the largest ever let by the city under this act. The plans include the largest amount of storm drains built under the act.

The plans include a seventy-six-foot asphalt-concrete surface three inches thick on a concrete foundation five inches thick, and vitrified brick gutters, between six-inch cement curbs, and eighteen feet on each side for sidewalks and lawns, the walks to be six feet wide, placed next to the property line, with the necessary culverts and drains.

The statistics of the improvement show the following figures:

Length of improvements, 16,722 feet (3.16 miles).

Width of asphalt roadway, 76 feet, except about one-fourth, which will be 72 feet.

Width of sidewalks, 12 feet, except where roadway is 72 feet.

Total width of street entire distance, 100 feet.

Approximate cost of pavement (762,000 square feet), $121,920.

Approximate cost of brick gutters (100,000 square feet), $30,000.

Approximate cost of sidewalks (131,000 square feet), $14,410.

Approximate length of curbs, 31,000 linear feet, cost $9,300.

Approximate cost of storm drains and culverts, $24,000.

Total estimated cost, $199,630.

The estimated additional expense runs between $25,000 and $50,000.

The improvement is to have the benefit of all that is modern in the construction line. The asphalt concrete surface is a combination of broken stone and asphaltic cement rolled to a consistency that gives it the appearance of sheet asphalt and a durability that is expected to be abnormal. While none of this pavement has been laid here, it has been tested in other cities of southern California and its character demonstrated.

All the sewers for which it is possible to secure a drainage outlet are either constructed or improvement proceedings for their construction are under way. This covers the boulevard from Marion avenue to Coronado street. The portion west of Coronado is dependent on a proposed main sewer, which must be built outside the city limits.

The storm sewers, drains and culverts have been provided so as to afford drainage and permit improved cross sections along the boulevard.

The cost of this work is to be assessed against a district from Bellevue avenue to the north city limits and from Marion avenue, Everett street and Elysian Park west to the city boundary line. The area includes about three square miles, and the assessments will be so made that the bulk will fall on contiguous property and the remainder assessed in a gradual decline until the remote property will bear only a trivial portion.

After the action by the council, the work on the improvement will be pushed as rapidly as possible. The work is the pride of the city engineer's office, and has been subject to the careful personal supervision of Homer Hamlin, City Engineer, as to its many problems.

COST OF GERMAN WATERWORKS.

By Dr. Robert Grimshaw, Dresden, Germany.

NATURALLY there can be no figures given which would give in advance the cost per head, of water works to supply the needs of any city, or even of any class of city; but for all that, it is interesting to know what existing water works have cost; and the accompanying table, on the authority of Mr. Hubert Joly, of Wittenberg, shows what the works in the principal German cities have cost. For convenience they are divided into three groups: (1) Those where the water is pumped and filtered; (2) those where it is pumped without filtering, and (3) those where there is natural fall.

(1) Where Pumped and Filtered.

	Cost per head, Marks.*
Posen	15.0
Lübeck	19.8
Magdeburg	24.4
Altona	25.6
Braunschweig†	28.9
Berlin	29.3
Stuttgart	32.4
Bremen	33.8

†Called by us Brunswick.

(2) Where Pumped but Not Filtered.

	Cost per head, Marks.*
Crefeld	18.2
Düsseldorf	18.3
Kiel	18.5
Essen	18.8
Koln‡	19.
Hannover	24.4
Strassburg	24.7
Chemnitz	25.9
Hamburg	26.
Aachen‖	26.2
Hale on the Saale	29.6
Dortmund	30.
Dresden	30.7
Augsburg	30.7
Karlsruhe	31.8
Mannheim	36.5
Leipzig	37.1

‡Called by us Cologne.

‖Called by us Aix-la-Chapelle.

(3) With Natural Fall.

	Cost per head, Marks.*
Danzig	15.7
München§	24.4
Erfurt	26.4
Nürnberg¶	27.6
Cassel	31.2
Wiesbaden	42.8
Frankfurt on the Main	80.9

*A mark is equal to 24.8 cents.

§Munich.

¶Nuremburg.

Curiously enough, the cheapest works of all are in Posen, where the water is both pumped and filtered; and in two cities, Mannheim and Leipzig, where there is no filtration, the cost is greater than in that city (Bremen), which has paid the most for both pumping and filtering. The cost of the works of Frankfurt on the Main is nearly double of the next most expensive (those at Wiesbaden), with natural flow; and five times as great as the cheapest with natural flow.

CONCRETE BRIDGE SPECIFICATIONS.*

By T. H. Mac Donald, Ames, Iowa.

THE first requirement of any set of specifications should be its ability to defend itself in any court of law, if it is permissible to express it in this way. That is, a specification should first of all be legal, which would mean the entire absence of catch phrases or the uncommon use of words or phrases that could be construed to the disadvantage of either party. Technical terms and phrases must of course constitute a large part of the text, and yet it is possible so to construct them that if read before a jury of twelve men the meaning and general fairness of the various clauses would be apparent if the finer technical distinctions were not.

*A paper before the Iowa Cement Users Association.

This may be well illustrated by the attitude taken by a capable engineer who uses a certain method for determining earth work. This method is not as accurate as some others, but he justifies its use because it is easily demonstrated to and understood by a jury as ordinarily made up. It is not questionable how long any specification will stand before a jury if the actual facts do not substantiate it.

A second important requirement is the practicability of the methods outlined. It is undoubtedly poor practice to write exceedingly stiff specifications if there is no intention of carrying them out practically as written. There probably never has been a piece of work where little adjustments did not have to be made from time to time as the work progresses, but which does not necessarily mean that the specifications are not practical. And there are also clauses which are included only to be used in the event of certain contingencies; for instance, we specify that no concrete shall be dropped more than three feet while being placed in the forms, but this specification is not strictly enforced unless concrete is being placed in thin sections or in water.

Specifications should also be definite to enable the contractor to know just as nearly as possible the grade of material he will be expected to furnish and the amount of work he will have to do, together with as much other accurate information of this character as possible. For instance, we try to specify the exact elevation to which the contractor will be required to carry his foundation at the price bid and allow an extra for concrete placed below this elevation.

For large bridges standard specifications will not prove applicable without the addition of many specific clauses, but for smaller structures, particularly for concrete slab culverts, general specifications can be used that prove fairly satisfactory for covering the work of a township or a county. A table has been prepared and is included which shows the thickness, the amount of reinforcing in square inches per foot of width, the stress in the concrete and in the steel for culvert slabs from two to twenty feet clear span. The loading used is the dead load, which includes the weights of the concrete and the earth fill plus a concentrated live load of a twelve ton traction engine mounted on axles, eleven foot centers, the rear axle carrying a weight of eight tons.

The classes of concrete to be used in these structures are as follows:

For the tops, Class A concrete.

For the side and wing walls, Class B concrete.

For the foundations and footings, either Class B or Class C concrete.

The following is our standard specification for classes of concrete:

Classes of Concrete.—The concrete shall be designated by classes which shall be proportioned as follows:

Class "A" concrete: 1 part cement, 2 parts sand, 4 parts broken stone or screened pebbles passing 2 inch ring.

Class "B" concrete: 1 part cement, 2½ parts sand, 5 parts broken stone or screened pebbles passing 2½-inch ring.

Class "C" concrete: 1 part cement, 3 parts sand, 6 parts broken stone or screened pebbles passing 2½ inch ring.

Sand Content.—Unscreened gravel may be used for Classes "B" and "C" concrete, subject to frequent tests by the engineer to determine the sand and pebble content, and in no case shall the sand be greater than the class requirements or less than is necessary to fill the voids in the pebbles.

Class "B" mortar: 1 part cement, 2½ parts sand (passing ¾ inch mesh).

The approximate quantities for a cubic yard of concrete of the above proportions are as follows:

Kind.	Cement.	Sand.	Screened Pebbles Broken Stone.
Class "A"	1.57 bbls.	0.44 cu. yd.	0.88 cu. yd.
Class "B"	1.25 bbls.	0.46 cu. yd.	0.92 cu. yd.
Class "C"	1.10 bbls.	0.47 cu. yd.	0.94 cu. yd.

NOTE.—It shall be permissible for the inspector to slightly vary the above proportions of sand and aggregate for the different classes to secure a denser concrete with the materials used.

It will be noticed that we do not adhere strictly to the exact amount of aggregates in the various classes where the materials can be used to produce a smoother concrete by slightly adjusting the amounts as given. The class "C" concrete is the weakest concrete that we use and at the present price of cement we believe it is false economy to use a leaner mixture, except in very heavy construction and even then we prefer a fairly rich concrete with one man rubble stone imbedded in this concrete. The division line between sand and gravel is placed at about a No. 8 screen and the advisability of following the specification in regard to determining the sand and pebble content is well illustrated by

the following table, which reports the results of tests made on samples sent in from various counties:

Gravel.	No.	Pebbles Per Cent.	Sand Per Cent.
Greene Co..	1	80.0	19.2
	2	46.3	53.7
	3	34.3	65.7
	4	43.0	57.0
	5	57.1	42.9
Carroll Co...	1	33.8	66.2
Story Co....	1	58.7	41.3
	2	47.3	52.7
	3	42.4	57.6
Emmet Co..	1	65.2	34.8
	2	30.4	69.6
	3	51.7	48.3

A variation in the compressive strength of these samples mixed in a proportion one part cement to six of the sample is illustrated by the seven and twenty-eight day test given:

COMPRESSIVE STRENGTH OF GRAVEL CONCRETE.

Gravel.	No.	7 Days 1-6	28 Days 1-6
Greene Co....	1	625	1030
	2	774	1490
	3	636	1170
	4	475	865
	5	557	1195
Carroll Co. ...	1	504	1137
Story Co.	1	720	1485
	2	735	1370
	3	531	1275
Emmet Co. ...	1	940	1950
	2	389	744
	3	465	873
Average		612.6	1215.3

The specification for classes of concrete is referred to in the following paragraph:

Measuring and Proportioning.—The proportions of the different classes of concrete shall be carefully maintained by some method of measuring satisfactory to the engineer, the cement being measured as packed by the manufacturers and the aggregate loose. The use of bottomless boxes and square wheelbarrows of uniform size, designed for this purpose, will be accepted as satisfactory methods.

Without going into this subject too much in detail it is perhaps worth while to include the following specification for the reinforcing steel:

Reinforcing Steel.—Except as otherwise specifically stated herein, all reinforcing steel used shall be of such a section as to provide a mechanical bond at frequent intervals and to insure a thorough contact between the steel and concrete. Net sections, sizes and distribution and bonding shall be exactly as shown on the drawings. The transverse bars shall consist of ½-inch round rods placed in pairs as shown on the drawings, and connected by a lattice bar of the required length, punched with 5/8-inch holes, and placed at intervals of 3 ft. The lattice bars shall be keyed to position by a small iron nail. Each bar shall be held rigidly to position by blocking to the forms and wiring to the bars it crosses. Medium steel, having an elastic limit not less than 32,000 pounds per square inch shall be used, and shall withstand cold bending equal to twice the diameter of the test piece without fracture. Only steel free

REINFORCED CONCRETE SLABS.
Live Load—One 12-Ton Engine.

Clear Span	Effective Span	1 Ft. Fill.				8 Ft. Fill.			
		D	M	C	S	D	M	C	S
2 ft.	2 ft. 6 in.	6 in.	1,387	530	0.30	6 in.	1,068	407	0.23
3 ft.	3 ft. 6 in.	7 in.	2,038	497	0.35	7 in.	1,899	461	0.33
4 ft.	4 ft. 6 in.	8 in.	2,757	467	0.40	8 in.	2,968	503	0.43
5 ft.	6 ft. 0 in.	9 in.	3,903	485	0.48	10 in.	5,083	485	0.55
6 ft.	7 ft. 0 in.	9 in.	4,730	589	0.58	11 in.	6,818	513	0.65
7 ft.	8 ft. 0 in.	10 in.	5,800	552	0.62	12 in.	8,830	538	0.76
8 ft.	9 ft. 6 in.	11 in.	7,430	559	0.71	13 in.	11,320	572	0.89
9 ft.	10 ft. 6 in.	12 in.	8,700	531	0.75	15 in.	15,215	550	1.01
10 ft.	11 ft. 6 in.	13 in.	10,100	510	0.79	16 in.	18,320	570	1.12
11 ft.	12 ft. 6 in.	13 in.	11,350	573	0.89	17 in.	21,975	595	1.26
12 ft.	13 ft. 6 in.	14 in.	13,020	550	0.93	19 in.	25,675	543	1.30
13 ft.	14 ft. 6 in.	15 in.	14,800	535	0.98	20 in.	29,830	561	1.42
14 ft.	15 ft. 6 in.	15 in.	16,370	591	1.08	21 in.	34,280	579	1.55
15 ft.	16 ft. 6 in.	16 in.	18,450	574	1.13	22 in.	39,140	598	1.68
16 ft.	17 ft. 6 in.	17 in.	20,700	560	1.19	24 in.	44,890	567	1.75
17 ft.	18 ft. 6 in.	18 in.	23,150	551	1.24	25 in.	50,440	582	1.88
18 ft.	19 ft. 6 in.	18 in.	25,180	599	1.35	26 in.	56,500	597	2.02
19 ft.	20 ft. 6 in.	19 in.	27,950	591	1.41	28 in.	63,650	575	2.09
20 ft.	21 ft. 6 in.	20 in.	30,950	583	1.48	29 in.	70,510	590	2.24

D equals depth of beam in inches.
M equals Max. Mom. in ft. lbs.
C equals compressive stress in concrete in lbs. per sq. in.
S equals area of steel in sq. in. per ft. of width.

from rust, dirt and grease shall be used, and some means shall be provided for cleaning the surface of the steel before placing."

The original tables include one for each foot depth of fill, only those for one and eight feet depths are reproduced.

THE GREAT ST. LOUIS FREE BRIDGE.

By L. C. Breed, St. Louis, Mo.

NO proposition, not excepting the Louisiana Purchase Exposition, has occupied a more conspicuous place in the public mind for several years past than the free bridge, not only locally, but nationally, and none has passed through a more varied and checkered career or met with more obstacles in its path.

The ordinance authorizing the submission of the proposition of a bond issue of $11,200,000, $3,500,000 to be used for bridge purposes, was approved April 3, 1906. It provided for an election to be held June 12, 1906, at which date it received the necessary two-thirds majority. On June 24, 1906, Congress passed a law authorizing the construction of the bridge.

On July 9, 1907, a bill was introduced in the City Council authorizing the construction of the bridge at the foot of Chouteau avenue, which bill was subsequently made an ordinance.

On January 31, 1908, an ordinance was approved authorizing the president of the board, with the approval of the mayor, to employ an engineer and such additional help as might be necessary. The president thereupon appointed competent engineers, who immediately entered upon their work.

The surveys included a district 1,000 feet on each side of the Pittsburg dyke, on the Illinois side, and running back about 6,000 feet from the river, with its buildings, streets, railroad tracks and property lines, and additional necessary information with reference to approaches. Five lines were thrown across the river, three south and two north of the Pittsburg dyke. A line was adopted as suitable for the center line of the bridge on both sides of the river. On this line soundings of the depth of the river were made. Surveys to determine the direction and the velocity of currents of the river, by float observations, surveys of the east shore line, one mile above and one mile below said located center line, and of the United States inner and outer harbor lines, were also made. Daily reports were made of the stage of the river over 7,000 feet frontage for a period of six weeks.

Surveys on the west side of the river extended over a district bounded east by river, west by Eleventh street, north by Gratiot street and south by L'Esperance street; connection with Manufacturers' Railway Company; the river front one mile above and one mile below the bridge location on the west side, and other necessary lines and areas. Triangulations were carefully made to determine distance across the river.

While the engineers were at work the City Council raised again the question of the physical character of the proposed structure and its approaches, and also whether it could be constructed for $3,500,000. The result was the enactment of an ordinance, approved December 31, 1908. Section one of this ordinance provides the president of the Board of Public Improvements shall, with the approval of the mayor, employ an engineer or engineers to continue the work looking to the construction of the bridge, to prepare plans therefor, and to superintend the erection thereof. Section two provides that said engineers shall prepare plans to be submitted to the War Department, make all necessary surveys, estimates, sites of the piers and abutments, decide upon the kind of structure to be built, prepare complete specifications, give a schedule of the approximate quantities of all material needed for the superstructure and approaches, inspect all material, and have complete supervision of the work.

January 15, 1909, there was introduced in both houses of the municipal assembly a bill to define the location of the municipal bridge, providing that the western approach shall be built in, upon and above Chouteau avenue, a vehicle approach to reach the ground in and upon Fourth street, and to so locate the bridge that it will not be necessary to acquire any property except north of Chouteau avenue.

On January 19, 1909, Boller & Hodge, of New York, were appointed the engineers for the construction of the bridge. They submitted a report to the city government, including the following data and recommendations:

The War Department requires three spans between the inner harbor lines, with water clearance of 65 feet over the flood record of 1903, elevation, 204.3.

The city of St. Louis requires a crossing at or near Chouteau avenue, with highway grade reaching surface at Fourth and Broadway, the bridge to have two steam tracks and two trolley tracks, in addition to a roadway and sidewalks, to accommodate which the bridge is required by ordinance to be double deck.

The physical layout of the streets and properties and the best modern practice permit no curvature on the shore spans of the bridge, or piers askew to the axis of the bridge.

So far as the river bridge alone is concerned as an engineering proposition, at this stage of the investigation, they see very little preference of location within the area of the surveys.

The lengths between outer harbor lines are 1,501.88 to 1,503.45 feet; and between inner harbor lines, 2,002.5 and 2,004.59 feet. The elevation of the bridge is determined by adding the elevation of flood, 1903, which is 204.30 feet; the government clearance, 65 feet; the space required for railroad flooring system and lower chord, 11.6 feet; making a total of 280.9 feet.

The elevation at Fourth street and Broadway is 210 feet, making the elevation to be overcome in 1,682 feet for a single deck bridge 70.9 feet. This is equivalent to a grade of 4.22 per cent.

For a double-deck structure, as required by the ordinance, must be added the legal clearance over railroad tracks of 22 feet plus floor depth of 5½ feet required by the cross girders for a paved floor and heavy hauling, or 27½ feet, resulting in an elevation at the shore pier of 98.4 feet above Fourth and Broadway, which requires a grade to run out at Fourth street of 5.86 per cent.

Another location slightly closer to Fourth and Broadway increases the grade of the approach to 6.15 per cent.

They regard the grades for either lines, single or double deck, as prohibitory for highway purposes, and demanding an extension of the west approach beyond Fourth street.

The east approach has no particular grade difficulties, but one line cuts through Southern Railroad property, and involves some long spans to clear the nest of curved tracks, while other lines avoid troubles from railroad interests, and seem far enough from the Pittsburg dyke to materially avoid the debris, riprap, etc., which, they are advised, have for many years been dumped to protect the dyke.

They call attention to the merits of a double deck for facilitating undercrossings on the approaches. It will be seen that the upper and lower decks must be parallel each other to maintain head room up to the point of departure on the approaches of the railroad tracks for north and south connections therefrom, before the highway can stiffen its grade, which is practically an impossible proposition under the circumstances. If north and south lines from the approaches are necessary, then the scheme of highway approaches must be extended so as to provide a workable grade, which, likely, should not be over 3 per cent.

Later studies seem to have convinced them that the beginning of the highway approach should be moved to Sixth street, and that the block of ground between Sixth, Broadway, Chouteau and Papin street should be used for a highway terminal. A part of this block would have to be bought, in any event, for a railroad approach. If the highway approach starts from Sixth street, they can reach a single-deck bridge with a short grade of not over 3 per cent. from Broadway to the bridge. A double-deck bridge would be impractical, even if they started from Sixth street, as the grade would be about 5 per cent., which is too steep. By starting from Sixth street, the approach would be sufficiently high to give a proper clearance over the railroad property south of Chouteau avenue, and the columns could be so placed as to allow these railroad tracks to remain practically as they are.

They therefore advise that, if possible, the ordinance be modified to allow the construction of a single-deck bridge; and they also suggest, if there is any further legislation required to start the approach from Sixth street, that this be introduced.

The Board of Public Improvements have, however, yielded to the ordinance which provides for a double-deck bridge, and have authorized the engineers, Boller & Hodge, to prepare plans and estimates for a double-deck structure.

EDITORIAL COMMENT

The New York Bureau of Municipal Research.

Cement Shows, One or Many.

Specifications For Quality of Materials.

THE NEW YORK BUREAU OF MUNICIPAL RESEARCH.

An organization started January 1, 1906, in New York city as the "Bureau of City Betterment" and incorporated in May, 1907, as the "Bureau of Municipal Research," seems to be doing a work with which municipal officials sympathize, and in such a way as to reduce antagonism to a minimum, and yet it has caused the introduction of improvements in business methods in city departments which will save many million dollars annually to the taxpayers of the city. The expenditure of something like $150,000 in the work of the bureau during the three years of its life is therefore fully justified, and, since the amount is raised by voluntary contribution, it is evident that the citizens of New York recognize the value of the work the bureau is doing.

As an example of its work reference may be made to the proposals submitted by it to the Board of Estimate and Apportionment for consideration before passing the budget of 1909. The recommendations are confined to three subjects.

It is shown that the pay rolls increased from $70,000,000 in 1907 to $80,000,000 in 1908, and to requests from departments aggregating more than $100,000,000 for 1909. It is shown that there is no adequate record, such as great private corporations maintain, showing by daily reports or time tickets the details of each employe's work, so that the Board of Estimate and Apportionment can know whether the number of employes is too great or too small, and there is no definite fixing of responsibility for the employes of the various departments so that certification of necessity for employes or of their competency can be called for when the question of estimates and appropriations for pay rolls is under consideration. In this connection, a provision, recommended by the bureau, that but one-twelfth of the annual appropriation for pay rolls can be expended each month, has materially reduced the deficits at the end of the year which had to be made up by special appropriations, and has greatly curtailed the running in of special employes on slight pretexts, who did not make sufficient return for the city's money received by them.

A second subject was the purchase of supplies and materials. No adequate idea could be formed of the sufficiency of appropriations from reports of previous years, and there were many methods of handling accounts which made it expensive for both honest and dishonest dealers to do business with departments, so that prices were high. Then the multiplicity of departments making purchases materially increased the cost of carrying on the business of purchasing city supplies. The recommendations of the bureau included the provision for full, accurate, certified reports of transactions, the provision for trade discounts for prompt payment, and the placing of responsibility for unnecessary delay of vouchers so that these discounts could not be secured, the checking of bills by an office whose business would be to keep fully posted on the current prices in the wholesale and retail markets of all supplies, and a central inspection staff to check up quality and quantity of material delivered.

A third subject was repairs and replacements, such as those for street pavements, sewers, fire hose, docks and ferries, and the many other items of this sort in a great city. Some of these are already in process of improvement.

There is danger of too great complication in large bureaus. The writer had some experience a few years ago in

collecting bills from the city of New York, for the payment of which some seventeen signatures of city employes, besides numerous affidavits and witnesses of signatures of dealers, were necessary to get payment for the smallest amount. This complication has been reduced materially, but doubtless in many cases at the expense of accuracy and safety. The middle ground is hard to find in so vast an organization as that of a great city.

The bureau publishes frequent booklets, circulars and reports showing the subjects in which it is interesting itself. These include street cleaning, municipal housing, salaries, inspections, street railroad relations, the park question, the city debt,, physical examination of children, the department of public health, the water revenues, gas and electricity, police, bureau of supplies and repairs, a department of municipal audit and examination. The number of circulars issued now exceeds 150. Some of the publications can be had for the asking, some are out of print, and some are for sale at prices ranging from 25 cents to $1.

Each large city can find a use for such a bureau as this. It is directly in line with suggestions made frequently by MUNICIPAL ENGINEERING, and, if properly managed, will earn its expenses many times over. Perhaps it is better to consider the bureau as a committee of the stockholders of the city (its taxpayers) than as a committee of its board of directors (the municipal officers), whether its expenses are paid by voluntary contributions or by an appropriation from the city treasury.

For the smaller cities a state supervision will be found more efficient, for reasons more or less obvious, and the state of Ohio is finding that the rather crude and greatly restricted form of this supervision which it has put in operation is saving the municipal corporations of the state, down to the township, millions of dollors.

Frederick A. Cleveland is the technical director of the Bureau of Municipal Research, and William H. Allen is the secretary. The offices are at 261 Broadway, New York city.

CEMENT SHOWS, ONE OR MANY.

A valued correspondent suggests a recommendation that one large cement show be given in the west each year, either at Chicago or some other large city, that the present rather unsatisfactory and expense conditions may be corrected. He says:

The show just held at the Coliseum at Chicago demonstrates that the cement user, architect or engineer, can see a great deal more for his money when attending one reputable exhibit than he can by running around to the various small shows. The Cement Products Exhibition Company at Chicago were also instrumental in obtaining special railway rates to their city, and as a whole their efforts should be commended. I feel that considerable expense can be saved for the exhibitors by making one large exhibit a year in the west.

This suggestion is quite closely in the line of that made in the February number of MUNICIPAL ENGINEERING, vol. xxxvi, p. 124, in the report of the convention of the National Association of Cement Users.

The management of the Chicago cement show has clearly demonstrated its ability to handle a large exhibition successfully, and with an exceedingly small percentage of objections, most of which were against rules which are absolutely necessary in so large an organization. On the other hand, the National Association of Cement Users missed its opportunity when it made its unfortunate attempt to develop its two related parts in almost opposite directions, has nearly pulled itself in two, and has emphasized the difficulty by its inexcusable continuance of its poor management of the business end of the combination, so that it now serves largely, so far as its exhibit features are concerned, as a maker of expense for the exhibitors without a corresponding return in the shape of new customers for their wares.

The technical features of the association's conventions seem to be quite satisfactory, and that branch of its work may well be continued in its present form as a national organization, but it will do the trade a real service if it will transfer its exhibit to the Chicago

show. Perhaps the same might be said of the national associations of builders, lumbermen, building material men, and the like. These organizations are also trade organizations, but there is not the same attempt to drag them into technical deep water that is made in the cement users' national association. It is now in the anomalous position of a trade organization whose management is trying to call it and treat it as a technical association. Let it become one or the other and the present difficulties disappear.

The case is somewhat different with the local organizations in Iowa, Nebraska, Oklahoma, Minnesota, and such others as may be formed. These associations are practically state bodies, made up almost entirely of men who do not and will not go to the national association or the big cement show. They want an exhibit, no doubt, but they want still more the discussion with their fellows of the problems which come up in their work, and they want the conferences with the trades people of whom they see only the traveling representatives during the year. These exhibits are smaller, are made up largely by local firms and local representatives of larger firms, and must be considered almost entirely as local affairs with a limited district to draw from. Such people as the trade journal representatives, the cement and other companies reaching widely extended fields, must stand the expense, if they think it worth while to attend all these conventions, and it is worth while of the business they develop is worth while. There is a place for these local conventions, and no amount of preaching against them will discourage them. They express a need of the trade, they benefit the trade, and so they will benefit every one connected with the trade.

SPECIFICATIONS FOR QUALITY OF MATERIALS.

It has long been a custom for architects, in specifying particular materials for their buildings, to name one or more brands as standards and to require that the materials actually used shall be equal to these standards in the opinion of the supervising architect. The custom has prevailed also among engineers, but not to so great an extent, and the tendency away from this form of specification is much more pronounced among engineers than among architects, many engineers following W. W. Crosby in his expression of a hope that "within a few years the engineering profession will be relieved of criticism for such specifications as 'Rotto asphalt or equally good thereto.'"

There are some reasons for such specifications which may be termed legitimate in the sense that they are not dishonest. One of these is ignorance of the materials to be specified. When one is thus ignorant it is so much easier to find out what material on the market is considered good than it is to find out what material is actually good, that the temptation to make the market article the standard is difficult to withstand. Part of this is due to laziness or real lack of time to make the investigation, and part is due to lack of confidence in one's own conclusions in such matters. The difficulty of decision is only postponed, however, for the contractor is quite likely to raise the cry of discrimination if he is not permitted to use something "just as good" and the engineer, to perform his full duty, must post himself so as to be able to make a safe decision.

Fortunately, there are now enough specifications of the better sort in common and public use to make it possible for the less informed engineers to copy them rather than the "as good as" clauses, and his final state is not worse than if he uses the older forms, but is really rather better. One reason for using the "as good as" specification which seems to have some force is the lack of laboratory or testing apparatus for determining the quality of materials, but, as indicated above, this is more fancied than real, and the number of public laboratories has increased so much that they are now within reasonably easy reach of almost any city in the country.

Municipal engineers are somewhat more restricted than others in the preparation of their specifications.

Some city charters and the laws and even the constitutions of some states prohibit the use of monopolized or patented articles, either wholly or in case their use is not absolutely necessary. The reference of the decision under the "as good as" specification as to what particular brand will be acceptable to the engineer or to his board or committee with his advice, gives opportunity for accusation of graft, which the courts may listen to if requested, whereas the statement of a scientific standard leaves the question of the approval of a proposed brand of the material open to appeal to higher scientific authority in case the engineer does not trouble himself to find out how to make a just decision. There is occasionally the architect or engineer who takes advantage of the "as good as" specification to favor one contractor over another in giving his information prior to the letting of the contract, or to secure a commission from dealer or contractor before permitting a substitution for the brand named in the specifications. Much of the power to do this is taken away if the scientific form of specification is used, for then the approach of the material to be used to the standard is, ordinarily, determinable without reference to the individual opinion of the architect or engineer, and flagrant departures therefrom can be made the subject of appeal to higher authority.

THE QUESTION DEPARTMENT

Methods of Determination of Water Rights.

My wife has fallen heir to a small municipal water works plant, and, in helping her to run the same, I have fallen heir to a lot of trouble.

The plant was put in fourteen and one-half years ago, and the head waters of a small brook were used as a source of supply. A reservoir was built some 300 feet above the town and the water rights of the abutters on the brook below the dam were never settled. The parties alleged to have such rights never presented a bill or claim for the same until the present moment, which is within a month or two of the expiration of the fifteen years' limit, which would entitle us to an absolute right to all the water.

Some thirty years ago there were one ro two small mills on this stream, long before any water company was thought of, but not since that time—i. e., none in existence for thirty years. For about two months in the year there is enough water to run a small circular saw, a few emery wheels and grindstones. Farther up the stream, in the summer time, there is used water for drinking purposes for cattle. It is alleged that in the summer time so much water is diverted for the town's use that the cows are very much disturbed.

In the settling of these cases the damages of these people seem to be more sentimental than actual. Whatever is just and equitable, if a real damage exists, I want to pay. I have no desire to do otherwise than to give each claimant what is just.

The water works has been mismanaged and neglected. The town's people have not always been fair to it. I am trying to bring order out of chaos, and as this is my first experience with public service corporations, or with anything that has to do with public affairs, I am learning something every moment.

I trust you will pardon this lengthy preamble, but I wish to explain to you that I am in a hard place and am trying to do what is right. My question is as follows:

What is the customary view that a judge or commission takes of claims such as I have described, in which none of the parties are really damaged? In what dollars and cents way does a judge or commission get at these things? We admit that we have used considerable water. We have given the town such fire protection, however, that in the past fifteen years there has been no serious conflagration in the town.

I have always been led to suppose that, when a properly conducted public service corporation was doing services to the town, it received some consideration in the hands of a court.

In getting at a horse power valuation of a very small brook, what is the customary line of computation?

I shall appreciate very much any references you can give me, and hope that I have not overstepped the limits of your question department.

P., ———, Mass.

This is a subject which is troubling the water works engineers of New England, and their association, the "New England Water Works Association," has a special committee which is wrestling with the questions involved at the present time.

The court decisions have been rather incongruous, and the principles upon which one decision has apparently been based can scarcely be applied to another case. This is due largely, no doubt, to the difference in the methods of presenting the cases to the courts, as well as to differences in local conditions. Many of these cases are tried without any scientific study of them, and the court is obliged to select the most probable solution out of a mass of conflicting testimony of volume and rate of flow, maximum, minimum and average power, flowage, storage, and so forth, which has no basis of exact measurement or computation. As a consequence a decision is quite as liable to be wrong as to be right. This does not apply to cases in which large interests are involved, where there are experts, but even in the large cases there are conflicts of so-called experts which reveal only parts of the truth. The committee referred to would like to bring some order out of this chaos, but does not yet show much evidence of hopefulness. The secretary of the N. E. W. W. Association, Willard Kent, Narragansett Pier, R. I., will doubtless be willing to give fuller information.

The value of a water power depends upon the uniform flow of water and the amount of storage possible to use in influencing this uniformity. The minimum flow is a controlling factor in determining the value of the water power, and this may be obtained approximately in a small stream by leading the ordinary low water flow over a weir, where it can be measured. The lowest water is seldom seen, but may be approximated by comparisons of relative volumes of flow, if the lowest water mark can be located in a convenient place for making the comparison. The volume of flow, thus measured, and the total fall within the limits of the mill site are the data from which to compute the gross horse power of the stream at that point.

An engineer can get together the facts in the case with some readiness, and when they are duly stated with authority it should be possible to make some sort of settlement, but if not, a case thus properly established will have much weight with the court.

Ordinance Controlling Tree Location and Roots in Sewers.

The councils of this city have passed an ordinance prohibiting the planting or growing of poplar, elm or willow trees within 100 feet of any sewer. The mayor, on the 4th inst., vetoed this ordinance for the reason that he gives in the following communication to the councils, to-wit:

"Gentlemen of the Select and Common Councils of the City of Corry—I hereby return bill No. 296, regarding planting elm, poplar and willow trees, without my approval, for the reason that I believe 100 feet much too far to limit said planting from a sewer.

"These trees are among the most ornamental used to beautify cities, and 100 feet from any sewer would practically eliminate their use by our citizens, and that distance is considered unnecessary to protect sewers in other cities.

"I inclose copy of a letter from the mayor of Jamestown, N. Y., which shows that they only dictate the planting of trees in the streets. Yours very respectfully, G. D. Heath, Mayor."

The councils have referred this ordinance and veto to me for a full report on the distance at which all kinds of trees should be prohibited from being planted, or should be allowed to grow from a sewer.

I have not been able to find any rules on this subject of what distance trees should be kept away from sewers, so that their roots will not damage the sewer, so I have taken the liberty of writing you, thinking that perhaps you might have made an investigation of this subject, or, if you have not made an investigation of it, you may have some information about it, for it is a subject, I should think, that every city ought to be interested in.

If you have any information relative to this, or any suggestions to make regarding it, I would be very thankful to receive them through MUNICIPAL ENGINEERING.

NEVIN R. DICKSON, City Engineer.
Corry, Pa.

The bill referred to is as follows:

An ordinance prohibiting the planting or growing of poplar, elm or willow trees within one hundred feet of any main or lateral sewer or branch thereof in the city of Corry.

Whereas, it has been demonstrated that the roots of poplar, elm and willow trees growing near sewers have and do enter such sewers, and wholly or partially obstruct the flow of sewage therein, to the great damage of the sewerage systems of the city of Corry, and that the planting and growing of such trees in the vicinity of sewers should be prohibited; therefore,

Be it ordained, by the Select and Common Councils of the city of Corry, and it is hereby enacted by authority of the same:

Sec. 1. That from and after the adoption, approval and publication of this ordinance it shall be unlawful for any person to plant any poplar, elm or willow tree within one hundred feet of any main or lateral sewer or branch thereof in the city of Corry.

Sec. 2. That any person who shall plant any such poplar, elm or willow tree in violation of the provisions of this ordinance shall be liable for each offense to a fine of $10 and costs, to be collected as other like fines and penalties are now by law collectible.

Sec. 3. That any person who shall maintain or permit to grow on his or her lot of land or premises, or on any lot of land or premises controlled by him or her, any such poplar, elm or willow tree, within one hundred feet of any main or lateral sewer or branch thereof in the city of Corry, may be required to girdle or destroy the same upon ten days' notice so to do, such notice to be served by any police officer of the city of Corry, and upon failure of such person so to girdle or destroy the same, such tree or trees may be girdled or destroyed by any person designated by the mayor or councils for such purpose, and the cost thereof collected in the manner provided by law, and in addition thereto every person so offending shall be liable for each such offense to a penalty of $10 and costs, to be collected as other like fines and penalties are now by law collectible.

Sec. 4. For the purposes of this ordinance the planting or growing or maintaining of every tree planted, grown or maintained in violation of the provisions of this ordinance shall constitute a separate and distinct offense.

This seems to be an attempt to attack a rather difficult problem from the wrong end and still some regulation of this sort may serve to relieve a situation more easily than another, if those interested are willing to agree to it.

The legal question as to the authority of the city to regulate the planting and destruction of trees outside the street areas is one for attorneys versed in Pennsylvania laws and court decisions.

While some trees, on account of the nature of their rootlets, their desire for water, their method of spreading, their harboring of insects, etc., might be termed nuisances and be abated as such, it would be necessary to prove that the term was properly applied in case any one objected to the provisions of the ordinance. Such ordinances have been proposed when there was a desire to get rid of particularly objectionable trees and have been put in effect with greater or less success, mainly through regulations adopted by the park department, the city forester, or some such officer.

In the case of sewer obstruction by such trees there arises the question whether, if the sewers had been properly constructed, any neecssity for this sort of regulation would arise, beyond the desirability of restricting the use of some kinds of poplar and willow trees on city streets for other reasons than their effect on sewers. If the joints of the sewers are tight, the rootlets cannot enter, and there is no trouble. It is very difficult to secure this result, and in a suit at law the case might turn on the relative value of tight sewers on the one hand and of street trees on the other. Then, too, while it is very difficult to clean the roots out of a sewer which has been neglected until the roots have grown and stopped the flow of sewage, there are sewer cleaning devices which can be run through a sewer occasionally and will remove the rootlets, before they have become obstructions, at small cost. This fact might have a bearing on the decision of the case.

There is the local question of the distance which the tree roots will travel to reach the water and food in the sewers. In most soils and with the amount of water supplied by some climates, no trouble is experienced with tree roots under any circumstances. Comparatively few cities and towns report any serious difficulty on this account. Where the soil is thin or porous and promptly drained of its water, or where the rock is near the surface and the ordinary supplies of water and food are deficient, the roots will travel long distances to find first a sewer trench excavated in the rock and refilled with soil, and then the supply of water in the sewer itself. In some cases a hundred feet would not be a sufficient distance to prevent the clogging of the sewer by roots. Under the above statements on both sides, no one would recommend the deforestation of the whole city. It seems to the writer to be more satisfactory to attack the problem from the sewer side. It is worth the relatively small extra cost of making the sewers as tight as possible and then cleaning them at regular intervals, to preserve the trees on the streets and on private property. It may even be advisable to relay sewers which are particularly open-jointed and make the joints tight by careful work or inclosure in concrete, and depositing some substance objectionable or poisonous to the roots where they are particularly obnoxious.

This question of treatment of tree roots in sewers has been discussed several times in MUNICIPAL ENGINEERING, in such articles as the following:

"How to Keep Tree Roots Out of Sewer Pipe," vol. xviii, p. 109.

"Device for Cutting Roots Out of Sewers," vol. xviii, p. 171.

"A Remedy for the Choking of Sewer Pipes by Tree Roots," vol. xviii, p. 243, giving a method of making tight and deep joints.

"Cleaning Small Sewers," vol. xxii, p. 155, giving the results of the use of an appliance for cutting roots out of small sewers, the use of which can be extended to larger sewers, as stated on p. 303. In vol. xxv, p. 89, will be found a short description of this appliance as applied to sewers of 4 to 10 inches diameter.

"Preventing Tree Roots from Entering Sewers," vol. xxvi, p. 434, where tamping a shovelful or two of salt around each joint is recommended by a correspondent.

"Roots in Sewer Pipe," vol. xxxiv, p. 239.

Other articles are based on the same principles as those stated in the above.

There are several articles giving descriptions of sewer-cleaning apparatus which may be found useful, such as the following:

"The Separate System of Sewers of Brantford, Can.," vol. xxii, p. 70, which describes the methods of keeping the sewers clean, as well as their construction.

"Sewer-Cleaning, a Vexatious Question," vol. xxvi, p. 284, giving a description of a sewer-cleaning machine.

"Tools Used in Cleaning Sewers," vol. xxvii, p. 418.

"Tools for Cleaning Sewers," vol. xxviii, p. 96, showing among others a root cutter.

"A Unique Sewer Cleaner," vol. xxxiv, p. 171.

Names of makers of sewer-cleaning tools will be found in some of these articles, and also in the "Business Directory," published in each number of MUNICIPAL ENGINEERING, under the headings, "Contractors' Tools and Machinery" and "Sewer Rods."

Specifications for Creosoted Block Pavement.

Please give the most recent specifications for creosote wood pavements in use in the city of Indianapolis.

C., Atlanta, Ga.

Upon the sub-grade and foundation prepared according to Forms "M" and "K" shall be laid the wearing surface, which shall be composed of long-leaf yellow pine. All blocks shall be of sound timber, free from bark, sap wood, loose or rotten knots, or other defects which will be detrimental to the life of the block or will interfere with the laying of the same. No second growth timber will be accepted. Blocks shall, in all respects, be satisfactory to the board of public works and the city civil engineer.

After the blocks have been inspected and found satisfactory they shall be placed in an air-tight chamber, where, by means of superheated steam and the use of a vacuum pump, all sap in the blocks shall be vaporized and the moisture in them removed. When the blocks are thoroughly dry and while the cylinder is under vacuum of 25 inches of mercury, the paving oil shall be admitted to the cylinder and pressure added until the blocks have absorbed at least twenty pounds of oil to the cubic foot of timber.

The paving oil used for impregnating the blocks shall be a heavy creosote product, the specific gravity of which must not be less than 1.12 at 68 degrees F., and not more than 35 per cent of it shall distill below 600 degrees F. with the thermometer suspended above the oil; the specific gravity of the residue obtained by distilling the oil up to 600 degrees F. shall not be less than 1.15.

The oil must be free from free carbon, absolutely soluble in bensol so that it will readily penetrate the wood.

The blocks shall be 3 inches in depth and 3 inches thick, the length being not less than 5 inches, nor more than 8 inches, with the fiber of the wood running in the direction of the depth.

The blocks shall be absolutely uniform in depth and thickness, and shall be laid with the length at right angles to the curb or at angles of 22½ degrees to the curb, as directed by the city engineer, in courses extending across the street. The blocks in adjoining courses shall break joints. The courses shall be laid strictly parallel and the blocks shall be laid close together, except at the ends, where the joints shall be one-quarter of an inch. Where curb is used other than the form of combined curb and gutter, four courses of block shall be laid next to and parallel with the curb.

The blocks shall be laid on a one-inch cushion of clean, screened sand, and shall be rolled to an even, smooth surface, with a steam roller weighing not less than ten tons, after which all joints shall be filled with a coal tar pitch of a quality satisfactory to the engineer. The surface of the pavement shall then be covered with a one-half-inch top dressing of clean, coarse sand. All excessive sand not taken up by the blocks shall be removed by the contractor without additional compensation, as soon as directed by the board of public works or the city engineer.

Each bidder shall file with the board of public works a sample of not less than a quart of creosote oil labeled with his name, and the name of the improvement on which bids shall be received, before 10 o'clock of the day on which bids are to be received.

Best Method of Purifying Sewage.

I am interested to know what is the best kind of a sewage disposal plant and its cost for a population of 10,000.

S. W. M., Mayor, ———, N. J.

This is a question which cannot be answered categorically, if at all. The local conditions will have much influence in determining which process will be best in any particular case. The most important of these conditions is the amount of purification which is necessary. In one case a simple settling basin may be sufficient, the removal of the coarse suspended material being all that is necessary. In another it may be desirable to use a coagulant of some sort to reduce the size of the suspended matter carried off in the effluent. In another, septic tanks and settling basins may be what is required. In another it may be necessary to add filter beds, of one sort or another, with single, double or triple filtration, as the demands for purity of effluent may require. The cost may thus vary from a few hundred dollars for a settling basin alone to many thousand dollars for basin filters, land areas and machinery and men for operating them.

MUNICIPAL ENGINEERING has published descriptions of many purification plants in use in this country and abroad, and will publish others from time to time. This department will cheerfully furnish any information it may have which will aid in the solution of particular problems, and, as to the general questions, refers to the volumes of the magazine which have been issued.

The most recent article appeared on page 173 of the current volume, March number, and is on "Sewage Purification by Sedimentation." Names of books on septic tanks are given on page 110, February number. A suggestion of sewage farms on Long Island for a part of New York's sewage is made in the January number. In like manner nearly every number has something of interest on the subject of sewage purification.

Specifications for Brick Pavements by the United States Paving Brick Manufacturers' Association.

Will you kindly tell me where I can get one or two copies of "Directions for Laying Brick Street Pavements as Promulgated by the National Paving Brick Man-

ufacturers' Association"? If they are published in pamphlet form I would like to have them. W. H. G., Logan, O.

The specifications referred to are published by the National Paving Brick Manufacturers' Association, and can be obtained on application to Will P. Blair, the secretary of the association, Board of Trade building, Indianapolis, Ind. Their advertisement of this fact will be found in each number of MUNICIPAL ENGINEERING.

Installation of Water Meters.

I should be glad if you would kindly send me approved specifications for installing water meters, with approximate cost, or, if this subject has been already treated in MUNICIPAL ENGINEERING, will you kindly specify where, as I have copies of MUNICIPAL ENGINEERING for several years. G. W., ———, Idaho.

There is not much on this subject in print. MUNICIPAL ENGINEERING has the following articles bearing on the subject:

In vol. xx, p. 280, is an article on the "Cost of Installing a Water Meter System," which gives some information regarding the installation of meters, which could be used in preparing specifications therefor.

In vol. xxx, p. 389, is an article on "Boxes for Water Meters," which illustrates and quite fully describes one method of installing water meters.

The city engineer of Richmond, Va., has had some valuable experience in this line, but his methods would doubtless require modification for use in a colder climate. The Superintendent of Water Works in Cleveland, O., made a report on installing meters which has some valuable information.

With reference to the general subject of the installation of water meters there are many articles. The following may be of particular interest in this case:

In vol. xxvii, p. 1, "To Meter or Not to Meter," and on p. 119, "Meters, Their Use and Benefit." In vol. xxx, p. 195, "What Is an Equitable Meter Rate?"

There are brief discussions of the subject and related matters in Turneaure and Russell's "Public Water Supplies" ($5); Folwell's "Water Supply Engineering" ($4), and Goodell's "Water Works for Small Cities and Towns" ($2).

In the "Business Directory," published in each number of MUNICIPAL ENGINEERING, will be found names of meter manufacturers and meter box manufacturers, and they can furnish much valuable detail of methods and cost. These names will be found under the headings "Meters" and "Meter Boxes."

Kinds of Pavement in Use.

I am interested at the present time to know what mode of street paving seems to be the most generally adopted in municipalities—crushed stone or macadam, asphalt, or vitrified brick pavement. If you have any statistics on these matters, I would be very glad to have you inform me in regard to it. Thanking you in advance, I remain,

J. H. PATTERSON, Mayor, ———, Ill.

Statistics of paving which have been published do not cover all the cities in the country. The only full statistics are those for cities of 8,000 population or more, published by the census bureau, and these are confessedly estimates to a large extent. The 369 cities of populations from 8,000 to 25,000 reported upon for 1903 had 17,212,489 square yards of brick pavement, 3,810,039 square yards of asphalt pavements of various sorts, and 38,095,775 square yards of macadam pavements.

The decision as to the kind of pavement to use should be made upon the basis of the needs of the street, rather than the general practice. In the smaller cities macadam proves quite satisfactory for most of the streets, but some of the newer bituminous macadams are showing marked improvements at increase in cost which is not prohibitive. The business streets in these smaller cities, and the main roads in from the country, are well served by brick pavements, which, together with stone, are the most permanent of any forms under light traffic. Asphalt is usually out of the question in such cities on account of the difficulty in making repairs promptly and properly. The effect of these facts is indicated in the comparison of the numbers of square yards of pavement of the kinds named in use in these cities, which are to this extent valuable indications, although they should not alone determine the particular pavement to be used on a particular street.

In the cities of populations between 8,000 and 25,000 in 1903 there were in use in that year the following pavements:

	Miles.	Per Cent.
Cobble stone	37.6	0.6
Granite and Belgian block	80.7	1.3
Brick	856.9	13.4
Wooden block	77.9	1.2
Asphalt and asphalt block	176.8	2.8
Macadam	2,473.6	38.8
Gravel	2,526.0	39.7
All other	141.5	2.2
Total	6,371.0	100.0

Efficiency and Durability of Wooden Stave Pipe.

Will you give me an opinion as to the efficiency and durability of wooden stave pipe, bound with round galvanized iron wire, for domestic water service, to be used as a pumping main with head of 340 feet, 8-inch pipe, discharging 400 gallons per minute, length of delivery, 8,000 feet; also as a gravity line, 8-inch pipe, 12,000 feet long, head 180 feet?

F. S. K., Douglas, Wyo.

In MUNICIPAL ENGINEERING, vol. xxxi, p. 21, will be found an expression of opinion regarding the value of wooden stave pipe, in which it is stated that the question is mainly one of comparative cost, but the heads used in the pipes described in the articles there referred to are much less than 340 feet. Since the date of that article there has been a discussion on the

subject in the American Society of Civil Engineers, in which some additional data upon the question of durability are given.

It appears that the Astoria, Ore., pipe, described in two previous volumes of the transactions of the society, and in MUNICIPAL ENGINEERING, vol. xxiv, p. 365, has not proved to be very durable, large sections of the conduit requiring renewal after ten years' use. This pipe line, some 10.5 miles long, is made of wooden stave pipe where the head on the pipe is less than 150 feet, and of steel pipe where the head is greater, except that a short length of wooden stave pipe is under head of 150 to 172 feet. The head of 150 feet seems to have been selected as that where economy required a change of material under the conditions existing in that locality.

A summary of the latest discussion on this pipe line, which appears in the transactions of the American Society of Civil Engineers, vol. lviii, indicates that the opinions of the experts engaging in the discussion, with some exceptions, are to the effect that air traps in the line may cause decay at those points; that a head of less than 50 feet may not be sufficient to keep the staves always wet, and that this would account for the tendency of the Astoria pipe to rot from without towards the inside, and for the occurrence of this rotting only where the head is less than 50 feet; that clay or loam free from vegetable matter, when of sufficient depth, is the best filling for the pipe trench, as it keeps the moisture in the staves; that organic matter in the filling next the pipe, or the growing of roots of trees or plants about the pipe, induces rot; that the pipes must be kept full of water practically all the time, so that there will not be alternate wetness and dryness of the staves; that the staves should not be bruised in laying; that the bands should be thoroughly protected from rust, etc.

With these considerations properly taken care of, the general opinion seems to be that the short life of Astoria pipe is not proof that wooden stave pipe is less durable than steel, or even cast iron pipe.

The conclusions seem to be also that local conditions will fix a maximum head for the wooden stave pipe, beyond which steel pipe should be used, which is somewhere about 150 to 200 feet, and that a gravity line should have a pressure on it of more than 50 feet, the sections at the ends in which the head is less than 50 feet being much more open to decay than the remainder of the pipe, and requiring frequent removal, while the pipe line under the greater head remains practically unchanged. The local materials and their effect upon wooden staves and metal bands must be thoroughly studied, and conditions made favorable to permanence of both.

Following are references to some of the articles in MUNICIPAL ENGINEERING on the subject: Vol. xxxi, p. 21, "Wooden Water Pipe." Vol. xxiv, p. 279, "Wooden Water Pipe Data;" p. 365, "Cost of Wooden Water Pipe." Vol. xvii, p. 296, "Use of Wood Pipe for Water Mains."

Cement Taste in Cistern Water.

How can I remove the taste of cement from water in new cistern?

WM. SCOTT, Cincinnati, Ohio.

The taste is caused by the dissolving in the soft water of the soluble salts in the cement wall. The amount of these soluble salts in quite small, and that part near the surface in the wall and bottom will soon be dissolved out. If the first water put in the cistern is allowed to remain a few days and is then pumped out, nearly all of the trouble will probably disappear. Certainly a very few fillings will reduce the amount below the point where the taste would be objectionable. If the wall after the first emptying is given a good waterproofing by the Sylvester process, alternate applications of soap and alum solutions at intervals of twenty-four hours, the cure can be hastened.

Ordinances Governing Sidewalk Construction.

I would greatly appreciate a little further information relative to the Indiana method to which you refer in your answer to my question in the March number, p. 175, as there are a number of points which are not quite clear:

(a) Under what conditions, if any, are individuals granted permission to construct their own sidewalks?

(b) Are they allowed to choose their own materials?

(c) How are proceedings instituted when a sidewalk or a number of sidewalks are needed in a particular locality—by petition from property owners interested, or some other methods?

(d) Does the city select the kind of material, or is that left optional with petitioners?

(e) If the owners of a majority of linear feet of lots remonstrate against the proposed sidewalk improvement, are the owners who are in the minority allowed any relief resulting from the non-construction of sidewalks?

(f) Who assumes the expense of sidewalk repairs when guarantees expire, and out of what fund is the money taken?

(g) Does the city assume any responsibility in reference to snow cleaning, accidents, etc.? H. F. H., ———, N. J.

It is very seldom in Indiana cities that individuals construct their own sidewalks, and when they do it is because they cannot obtain signers enough to a petition to have all the sidewalks on the block laid by public construction. In case they are laid by individuals, permission is given by the board of public works, and a fee is charged which is sufficient to pay the inspector to see that the sidewalks are constructed according to the specifications prescribed by the board of public works. There is not much choice of materials, as cement walks cost so little more than good brick walks that they are almost always preferred. Property owners are really not given authority to choose their own materials, although what they may have to say will

influence the board in its decision more or less.

The board of public works can order sidewalks constructed without any petition, but it is seldom that they do so, waiting until there is a petition from enough of the property owners, especially the resident property owners, to insure that there will not be a legal remonstrance against the construction of the sidewalks.

Until the last legislature closed its session the board of public works chose the kind of material to be used for pavements of all sorts, but paid more or less attention to the desires of the petitioners, since a majority of the resident property owners can remonstrate against the construction of the sidewalk under a given resolution, but the legislature passed a law requiring bids to be received on different kinds of material, and providing that the property owners could then choose the kind of material they wished with the knowledge of what all the different materials would cost.

The Indiana law provides that remonstrances can be made by property owners resident on the street. The consequence is that the property owners who are benefited by the sidewalks determine whether they shall be laid or not, and so there is seldom any question of relief of those who fail to secure walks which they desire. In case there is such failure, the street commissioner may be instructed by the board of public works to make a gravel walk, or some such improvement which will lift walks as much out of the mud as possible.

With cement sidewalks there are so few repairs that there is seldom much question on this point. What few repairs there are are made by the street commissioner and paid for out of his funds for taking care of streets and sidewalks which are not under guarantee by the contractors.

The city assumes no responsibility in reference to snow cleaning, accidents, etc., but it has ordinances requiring snow to be cleaned off and provisions for notification to property owners, and consequently the transfer of the responsibility for damage or accidents on account of the failure to clean off the snow to the property owner. If a person was injured on account of a defect in the sidewalk other than the presence of ice or snow, the city could be sued for damages with prospective success, but with the level streets and the almost universal use of cement sidewalks, there are practically no suits for damages on account of accidents on sidewalks.

Will Electric Light Plant Be Profitable?

Will you kindly advise if you think private ownership of an electric light plant would be profitable here? This is a town of about 3,000 inhabitants, and would probably take 30 arc lights for streets at $70 each, and about 1,000 incandescents for residences. Inclosed find some of the prices of our neighboring town, which may aid in your estimate. We can have furnished us electric power, by water, at $25 per h. p. per year, we to own the transformer. H., ———, S. C.

The rates referred to are, for light service up to 100 k. w. per month, 10 cents, with a minimum charge of $1, and above 100 k. w. 8 cents; for power a graduated schedule from 8 cents for 1 to 100 k. w. hrs. to 2 cents for more than 10,000 k. w. hrs., with a minimum of 50 cents per horse power per month; 10 per cent. penalty if bills are not paid by the 10th of each month.

This question cannot be answered definitely without more information and study than the question gives. A considerable number of cities and towns the size of this are served by private companies, and apparently with success. In the January number of MUNICIPAL ENGINEERING, on page 33, will be found some figures regarding the rates paid for public and private lighting in cities and towns of 1,000 to 3,000 population in New York which are of interest. The article also gives a sketch of a franchise for an electric light company. Whether a company in a town which has not had such a company heretofore will be a success will depend not only on the terms made with the city for public lighting, but upon the business which can be obtained from the citizens. The question of cost of construction and of power is also very important, and while the figure for power is reasonable, it is only one point. The chances are that a company could be successful if it were properly started in business without making mistakes in construction, and if it were managed by some one who can develop the business the town ought to have. But mistakes in the beginning and poor management will break any company, and there is not very much room for such mistakes in a town of this size. The final decision should be based on the conclusions of an expert who has had an opportunity to study the situation thoroughly.

Information About Septic Tanks and Sedimentation of Sewage.

I would like very much to get information in regard to the practical use of septic and sedimentation tanks in our different municipalities in this country, also, if possible, from European municipalities. If there are any books published with the reports of the workings of these systems, kindly let me know.
J. B., Narragansett Pier, R. I.

Reference may be made to other answers to similar questions in this number and in the January and February numbers of MUNICIPAL ENGINEERING. There are numerous articles in the volumes of this magazine giving descriptions of plants in use in this country and in Europe. In vol. xxxi, p. 280, and vol. xxxiii, p. 249, will be found long lists of these articles. Articles appearing since these lists were made are the following:

In vol. xxxi; "Sewage Disposal," p. 394;

"Advance in Sewage Purification," p. 439.

In vol. xxxii; "Septic Tank for Chautauqua Grounds," p. 17; "Explosion of Saratoga Septic Tank," p. 42; "Cities Using Septic Tanks," with references to descriptions thereof, p. 95.

In vol. xxxiii; "Sewage Disposal by Biological Processes," p. 173; "Progress in Sewage Disposal," p. 312; "Sewage Disposal Plant at Kew Beach, Toronto, Ont.," p. 315; "Septic Tank Construction," p. 339; "Sewage Disposal for Institutions and Small Communities," p. 379.

In vol. xxxiv; "Septic Tank for Creamery Waste," p. 30; "Septic Tank Patents Sustained," p. 94; "Patents on Sewage Purification Process Sustained," p. 107; "Storage Time of Sewage in Septic Tank," p. 236; "Efficiency of Sewage Disposal Plants in New York," p. 242; "The Septic Tank Patent Questions," p. 303.

In vol. xxxv; "Electric Purification of Sewage," p. 40; "House Sewage Disposal," p. 116; "Sewage Disposal in Columbus, O.," p. 211; "Methods of Sewage Purification," p. 240; "State Control of Sewage Disposal," p. 242; "How to Build Residential Sewage Disposal Plant," p. 244; "Septic Tank Patents," p. 288; "The Septic Tank Patent Litigation," p. 311; "Residential Septic Tanks," p. 316.

In vol. xxxvi; "Sewage Purification by Sedimentation," p. 173. Most of these numbers can be supplied at 25 cents each.

Venable's "Methods and Devices for Bacterial Treatment of Sewage" ($3) is the only book on American practice, and this is restricted practically to the author's practice. Raikes's "Design, Construction and Maintenance of Sewage Disposal Works" ($4) is a new English book on the subject of much value. Baker's "British Sewage Works" ($2) gives brief descriptions of a number of sewage disposal plants in England and on the European continent. There are several older English books giving more or less detail about septic tanks among other methods of sewage disposal.

Wooden Floor on Concrete Base.

I am interested in building a roller skating rink, and desire a floor on the ground, rather than up off the ground on sills and joists, so as to prevent rumbling as much as possible. I have in mind a floor built as per sketch, but feared that the board floor might be short-lived because of dry rot from lack of ventilation. What do you think about it? Would the air circulating through the drain tile and finding its way through the cinder foundation and the concrete, if same were very porous—say made of coarse cinders—give ventilation enough? Or could you suggest some better method of making the floor so it would be as quiet as possible? H. C. H., Macomb, Ill.

The sketch is not reproduced. It shows the compacted earth graded to slope 4 inches in 6 feet from summits to hollows, below the bottom of which are laid 3-inch drain tile transversely. On these slopes are laid cinders 4 to 8 inches deep, making the top of the cinders level; then come 4 inches of concrete with 2 by 4 beveled strips 2 feet apart imbedded flush with the surface as nailing strips on which to lay the floor, which is of ⅞-inch yellow pine with a maple wearing surface on top.

The floor seems to be well designed and to conform with ordinary practice. It would seem probable that the floor would absorb moisture rather than be in danger of dry rot, particularly if there is any danger of water backing up in the tiles at any time.

Will our readers report their experiences in this line?

Concrete Swimming Pool—Paving Specifications.

I would like information on building a swimming pool 20 by 60 feet, using concrete and veneered brick.

I would like estimates of cost and specifications for bitulithic, brick, asphalt and stone block paving. I consider your information reliable and of good service to me.

M. A. H., Newton, Kan.

A swimming pool may be in the form of a basin with concrete walls or concrete lining of an excavation in the earth. A reinforced concrete reservoir lining is described in MUNICIPAL ENGINEERING, vol. xxxiv, p. 238. Method of finishing concrete surface is described in vol. xxxiv, p. 169. Method of laying a tile floor is described in vol. xxxvi, p. 175, and there is an illustrated article on "Public Baths" in vol. xxxiv, p. 85, showing swimming pool lined with enameled tile or brick.

Rather general specifications for asphalt paving will be found in an article in vol. xxxv, p. 354, further specifications will be found in vol. xxxiii, p. 394, vol. xxxii, p. 155, full specifications for asphalt surface in vol. xxx, p. 352, and further information about mixtures and details in vol. xxix, pp. 287, 291, 325, 370, vol. xxvii, p. 437, vol. xxvi, pp. 430, 303, 360, vol. xxv, p. 339, etc., and information about cost of repairs in vol. xxxiv, p. 213, vol. xxxvi, pp. 42, 115, 143, 169; and cost of construction in vol. xxix, pp. 203, 429, vol. xxvi, pp. 102, 263, 10, 16. There is an excellent article on preparation of asphalt paving mixtures in the March number, vol. xxxvi, p. 141, and one on laying the pavement in this number.

A most complete and thorough exposition of the best method of laying brick pavements is given in vol. xxxv, p. 279, and some description of other specifications on p. 141. There are many other articles appearing in every volume of MUNICIPAL ENGINEERING giving all possible details of methods and results of brick paving; these two are the latest. Three others giving full details will be found in vol. xxxiii, pp. 85, 160, 390.

Specifications for all classes of pavements will be found in such books as Tillson's "Street Pavements and Paving Materials" ($5), Richardson's "Asphalt Pavements" ($5), in which the fullest treatments of aphalt will be found, Byrne's

"Highway Engineering" ($5), which specializes on macadam and stone pavements, Baker's "Roads and Pavements" ($5), which gives the best treatment of brick paving.

Patents on Septic Tanks.

Would you kindly inform me in what numbers of your paper I would find articles on lawsuits with regard to the validity of the Cameron patent on septic tanks? I believe that judgments were given by some courts in the United States with regard to the claims of this company, and I am under the impression that only when the tanks are closed can a patent be claimed.

B., Hamilton, Ont.

An excellent analysis of the decision in the Saratoga Springs case regarding the validity of the Cameron patents on sewage disposal will be found in an article on "Septic Tank Patents" in MUNICIPAL ENGINEERING, vol. XXXV, p. 288. A further discussion will be found on page 311. The distinction between settling tanks and septic tanks is drawn in the first article mentioned. The decision seems to apply only to septic tanks where the process of purification goes on by the aid of bacteria, light and air being excluded and the liquid lying undisturbed by the inflowing or outflowing sewage or by processes of cleaning. Very few tanks in this country answer this definition exactly. An organization of engineers has been formed to carry the matter further when opportunity offers, and secure further definiteness in classification. The matter is apparently one of royalties for past uses of the patents, especially in Canada, as some, at least, of the English patents expire shortly.

Can Brick Street Be Refilled with Waterproof Filler?

Some two years ago this city paved a number of streets with brick, using a sand filler which has proven to be very unsatisfactory. Feeling that something must be done to correct this mistake made by us, we would like, if possible, to have you secure some advice as to the best method to pursue, and the best filler to be used. Had we used a water-tight filler we could have flushed the streets instead of sweeping them, whereas now we do not dare to use water on them at all, as it immediately removes the filler. We thought that if we did decide on some water-tight filler we could then flush the streets and wash out as much of the sand as possible between the layers of brick.

W. E. ADAMS, Mayor, Deadwood, S. D.

In MUNICIPAL ENGINEERING, vol. XXV, p. 156, will be found a report of an absorption test, made by the writer, of paving brick taken from a pavement and put through the test without cleaning, in which it is stated that the brick showed no absorption of water on the first test, but after they had been washed and brushed they showed an absorption of more than 1.5 per cent., although only the worn edge of the brick was thoroughly cleaned. This indicates that the bricks as they lie in the pavement could not be cleaned thoroughly. Even a small amount of dirt, such as is dropped from wagons hauling building material on planks over a newly laid brick pavement, not yet filled, has prevented a perfect bond of filler with brick, which resulted in a defective area of the pavement at the spot where the hauling was permitted, although the remainder of the pavement is in good condition. The film of fine dirt or slime on the brick surfaces, whether side or wearing edge, prevents the adhesion of the filler to the brick. This is true of both cement and bituminous fillers.

The only way to prepare the brick properly for the new waterproof filler seems to be to wash each brick in clean water, using a brush to scrub it. The bricks can then be relaid in the street and the filler put in according to directions given in great detail in recent numbers of MUNICIPAL ENGINEERING, notably in vol. XXXV, pp. 141, 279, vol. XXXIII, pp. 85, 160, 390. If the bricks have been worn unevenly, it may be necessary to turn them at the same time, so as to give a new wearing surface. This will be particularly necessary if there is indication of incipient chipping cracks, which will soon result in slivers or larger pieces of the brick breaking off. New bricks will be necessary to replace those found defective on the new wearing side and those which have been broken or show that they are softer than others.

Wooden Stave Pipe for Water Supply System.

Will you kindly favor me with information relating to wooden stave pipe, either through a query in your question department or editorially, so that I may profit by the most extended experience possible of others who are acquainted with the subject by practical observation and experience, and not from theory?

What has been the experience of others, especially in small cities, villages or towns of limited means, in the use of wooden stave pipes for water works?

What precautions were taken in connection of pipe with cast specials and hydrants?

What has been their experience of chemical action of the soil, especially of alkali, upon the wire wound around this pipe, and to what extent has this wire failure been noticeable on pipes under fire pressure or otherwise?

Is this pipe considered a success for towns, villages and small cities from practical experience, and if not, what was the particular cause leading to the failure where pipe was properly protected before going into the trench?

What trouble was encountered in leakage of pipes and connections, where properly laid; for what length of time was leakage noticeable, and what means were adopted for stopping same, if any?

A. W. M., ———, Mont.

Reference may be made to the answer to another question on this subject this month for some discussion of the matter and references to more detailed articles elsewhere.

The general limitation of pressure on pipes of this sort seems to be, say 200 feet, or about 87 pounds per square inch, which is sufficient for most village, town or

small city service. There are several makers of wooden pipe other than stave or built pipe, which are provided with systems of specials and methods of connection, and have solved most of the problems of this sort connected with the use of wooden pipe in a water works distribution system. The wooden pipes are properly protected from causes of decay and the metal reinforcements must also be protected against action of any chemicals in the soil or in the water. If the pipes are properly made and laid there is little or no leakage when first laid, and it disappears shortly.

Will our readers answer the specific questions of our correspondent out of their experience?

Books on Electrolysis.

Will you kindly refer me to some standard authority on electrolysis, more especially as applied to electrolysis of water supply pipes laid near to an electric street railroad? What I want to know is the best and most effectual preventive remedy for such damage to water pipes, as frequently occurs under conditions named.

J. H. PUTNAM, City Engineer,
Hattiesburg, Miss.

There seems to be but one book devoted exclusively to this subject, Michake's "Stray Currents from Electric Railways" ($1.50). Houston and Kennelly's "Electric Street Railways" ($1) and a paper on electrolysis of underground conductors in the set of papers before the International Electrical Congress published under the title "Electric Railways" ($3) give a chapter each to the subject from the electric railway engineer's point of view. Hubbard and Kiersted's "Water Works Management and Maintenance" ($4) and Turneaure and Russell's "Public Water Supplies" ($5) each gives a chapter from the water works engineer's point of view. The latter book gives a number of references to articles and papers before associations upon electrolysis. There have been many articles on various phases of the subject in MUNICIPAL ENGINEERING, full lists of which will be found in vol. xxxv, p. 32, and vol. xxxii, p. 19. One on conditions in St. Louis in vol. xxvi, p. 331, is fully illustrated.

Articles on Street Cleaning—Index to Municipal Engineering.

I don't know whether your leading periodical has ever been inserting any articles as follows: "History of Street Cleaning in Europe and America," "Lists of Equipments and Tools of Different Systems." If there are any of these two kinds in question, please let me know what they are.

If you have printed a reference index of your magazine, please let me know whether free or charged.

B. T. L., W. Philadelphia, Pa.

There are numerous articles on street cleaning in MUNICIPAL ENGINEERING which together give a very good history of the business and also describe most of the apparatus used. Lists of these articles will be found in vol. xxxv, p. 179, and in vol. xxxiv, p. 299.

No general index of MUNICIPAL ENGINEERING has yet been published, but one is kept in the office, and abstracts from it on any subject can be supplied on request.

Concrete Coffins—Metallic Concrete.

I note in "A Hand-Book for Cement Users" (third edition), edited by Charles Carroll Brown, p. 167, where it says:

"There are several forms of burial caskets in concrete, monolithic and in slabs which fit together so as to be locked and water tight."

Again, I note in a book on "Concretes, Cements, Mortars, Plasters and Stucco," edited by Fred T. Hodgson, pp. 476 and 477, that the author invented and registered an idea for an impermeable, indestructible, hermetically sealed coffin, and speaks of it being made of a specially prepared metallic concrete, etc.

Being personally interested in the manufacture of concrete casket cases or outside concrete boxes for receiving the coffin, I would like to ask the following question, if not an intrusion on your valuable time:

Is there at present any one extensively engaged in the manufacture of concrete coffins or coffin boxes (i. e., boxes made and kept in stock, not formed in the grave)? If so, could you give me their addresses?

What is "metallic concrete," and how prepared? F. B. D., St. Joseph, Mo.

There are numerous makers of concrete burial vaults and concrete coffin boxes. The burial vaults are some of them made in place in the grave. Some are made of plain or interlocking slabs and parts which are put in place in the grave and set, and some are made in box form to lower into the grave with a cover to put in place after the coffin is lowered, the cover often being set with locks and with cement so as to make the concrete box water tight and difficult to break into. The writer does not know of any concrete coffin proper, all the forms above mentioned being substitutes for the outside box rather than the coffin itself.

Following is a list of makers of concrete burial vaults not distinguished as to the form used:

Aurora Cement Grave and Vault Co., Aurora, Ill.
Baker Burial Vault Co., Toledo, O.
Ball & Brookshire, Thorntown, Ind.
Balzer Bros., Des Moines, Iowa.
Egyptian Vault Co., Rockville, Ind.
Theo. F. Gabler, Rockville, Ind.
Kaufman Burial Vault Co., London, O.
Mateer Bros. Co., Joliet, Ill.
Norwalk Vault Co., Norwalk, O.
Mississippi Valley Burial Vault Co., Clinton, Iowa.
L. L. Parry, Mansfield, O.
C. M. Peckham, Norwalk, O.
D. L. Richards & Co., Crawfordsville, Ind.
Sanitary Burial Vault Co., Rockville, Ind.
Southern Ohio Vault Co., McDermott, O.
Van Camp Burial Vault Co., Indianapolis, Ind.
G. R. Woodburn, Detroit, Mich.

Will our readers add to this list, and

will they report any concrete coffins which may be manufactured?

Some of the vaults used are reinforced with steel rods or bars or wires or wire cloth, and they are then said to be made of reinforced concrete. Possibly this is what the author referred to means by metallic concrete, but if so he has used the term incorrectly. Possibly the concrete is treated in some way to make it look like metal and takes its name from its appearance.

Manufacturers of Bags for Cement.

We have been informed that suitable paper bags were extensively used, both in Canada and in the States, for packing cement and gypsum. We are greatly interested in cement works in Egypt, and, the question of packing being a very important question, we should feel greatly indebted to you if you would kindly give us the benefit of your experience on the subject. What we require is a paper bag strong enough to withstand railway carriage and also stacking (two or three rows); the bag to hold 110 pounds of cement with a suitable fastener. Samples and prices f. o. b. Alexandria or f. o. b. American port would greatly oblige us.

L. & R., Alexandria, Egypt.

I shall be very much obliged if you will kindly give my name to several of the cement firms mentioned in the "Directory of American Cement Industries," published by you in 1902, with request that they will very kindly give me a quotation for paper bags for cement, and if possible submit a sample. M. J. L., Cairo, Egypt.

A new edition of the "Directory of American Cement Industries" ($5) is in active preparation for early issue, which will have full lists of makers of bags for cement, both paper and cloth. Meantime the list is furnished in manuscript to interested inquirers.

Articles on Concrete Pavements.

Will you kindly refer me to articles in MUNICIPAL ENGINEERING on the Blome concrete pavement? F. A. T., Boise, Ida.

The following articles give descriptions of the Blome concrete pavement:

"Municipal Engineering at Gary, Ind.," vol. xxxiv, p. 329.

"The Evolution of Pavements," vol. xxxiv, p. 336.

"The Blome Concrete Pavement," vol. xxxv, p. 369.

There is a list of other articles on concrete street pavements in vol. xxxvi, p. 32.

FROM WORKERS IN THE FIELD

Practical Points from Practical People.

Contributions to this Department are invited. Give from your experience for the benefit of others. No matter about the style of the composition, the fact is what is wanted. Use the Question Department for what you want to know; use this Department for what you can tell others.

Protection of Hydrants from Freezing.

To the Editor of MUNICIPAL ENGINEERING:

Sir—I see in your March number some methods of taking care of hydrants in freezing weather. Where you have sewers it is easy to drain your hydrants by making connections from the bottoms of hydrants to the sewers, and as the manholes, as a rule, are at the ends of the blocks with the last lot lines, as also the hydrants, they can be drained into the manholes without digging down into the sewer. I am taking care of about a hundred hydrants, and I find the best way to take care of them where the ground is wet and you have no sewer is by plugging up the drain hole. In case of using the hydrant for fire purposes or flushing, I use a small hand pump, about 2 inches inside diameter and 14 inches long. Connect same with a piece of garden hose about 8 feet long so it will reach to the bottom of a 7-foot hydrant, and leave enough on the outside of nozzle cap to pump. If the main valve is waterproof, I have no more trouble during the winter. For those that are about 3 or 4 feet above sidewalk grade I have boxes about 3 feet square to place around them in the fall. This will protect them some also.

JOHN STUESSI, Street Commissioner,
South Milwaukee, Wis.

Guarantee for Permanent Pavements.

To the Editor of MUNICIPAL ENGINEERING:

Sir—The Board of Control of Toronto recommend the adoption of the appended report of the city engineer re reduction of guarantee period for permanent pavements, viz.:

All contracts for the construction of asphalt, bitulithic, granite setts, vitrified block pavements, call upon the contractor to maintain same for a period of ten years. This long term of guarantee was asked originally more especially for asphalt pavements, because very little was known about the use of this class of material.

We have now a much better knowledge of the various asphalts, and nearly every city engineer has now connected with his department a chemist and a first-class laboratory, which affords every facility for making chemical tests of the various materials used in the construction of roadways. This being the case, several cities have reduced the guarantee period from ten to five years, and in some cases to one year.

I have interviewed some of the contractors here, and they have assured me that if this period could be reduced there would be a corresponding reduction in the cost of pavements.

I would recommend to your board that the guarantee on the permanent pavements mentioned above be reduced to five years.

On February 22 the recommendation of the city engineer that the guarantee on bitulithic paving be reduced from ten years to five years was adopted.

C. H. RUST, City Engineer,
Toronto, Ont.

Dimensions of Concrete Arch.

To the Editor of MUNICIPAL ENGINEERING:

Sir—I see in the question department inquiry in regard to 20-foot span concrete bridges. I have had some experience in such, and will send description.

For foundation of abutment, unless we thought it unnecessary, we drove piles about 2½-foot centers. Abutments at the bottom about 5 feet thick, according to heighth of sidewalls, which will be governed by height of roadway, and at springing line 4 feet in thickness. Rise of 4½ feet and the crown about 16 inches. Wing walls built to suit the location at an average of 2 feet in thickness. The whole reinforced with ¾-inch corrugated steel bars placed in the abutments perpendicularly 1½ feet apart, in the arch 1 foot apart and 4 inches from lower surface of arch, with a connection to the rods in the abutments. Vertical projecting rods for the purpose of connections of railings and coping that may be desired.

J. D. B., Cedar Rapids, Iowa.

Cost of Operating Municipal Asphalt Repair Plant in Indianapolis.

To the Editor of MUNICIPAL ENGINEERING:

Sir—In the report of this municipal asphalt repair plant published in your magazine in February, Trinidad asphalt is quoted at $20 per ten. It should be $29 (twenty-nine) per ton. I thought it was a misprint in your first published copy of the report in February, but in your compiled data in your March number I notice it is quoted at the same price. As this makes quite a difference in what the asphalt work would cost, I wish you would correct it.

I would also like to state, in this connection, that the cost of doing the work, as mentioned in my report, included everything in any way connected with the work—superintendence, clerical work and even interest on investment and depreciation based on the total cost of plant, buildings and tools, figured at 5 per cent. for 6½ months, which was the length of time the plant was in operation.

SAM R. MURRAY,
Supt. Municipal Asphalt Repair Plant,
Indianapolis, Ind.

The error was a typographical error which was not caught in the proofs, Mr. Murray's letter showing the cost of the Trinidad asphalt to be $29 a ton.

A New High-Pressure Reinforced Concrete Pipe.

To the Editor of MUNICIPAL ENGINEERING:

Sir—A well-known water works builder in New England was at work for some six years before his death in perfecting a new cement-lined service pipe and a new armored concrete wrought iron high-pressure hydraulic pipe. Some of the leading hydraulic experts in Boston, New York and Philadelphia say that the result is a composite pipe, at last, that meets every criticism.

The pipe will stand any pressure that is desired, is not attacked by electrolysis or salt water, can be tapped into, absolutely without injury to the pipe, and can be made to stand any pressure that cast iron, wrought iron or steel pipes will stand. The joints can be flange or bell and spigot, and put together with lead the same as cast iron pipe, or the Dayton coupling. The pipe is unlike anything that so far has been made.

The pipe comes in 10 and 12-foot lengths. All pipe is tested at 300 pounds, hydraulic pressure, before it leaves the factory.

If the old pipe made of stove funnel and natural cement, which was put in some fifty years ago, is still good, with all its weaknesses, bad joints, and other poor qualities, there must be no limit to the length of time this new pipe will stand.

G. W. P., ———, Mass.

Longbeach Seaside Boulevard.

To the Editor of MUNICIPAL ENGINEERING:

Sir—Regarding the proposed improvement of Seaside Boulevard, Long Beach, Cal., I send herewith a sketch that will, in connection with this description, give a fair idea of the character of the work.

Nature has smiled on Southern California and given it many attractions, but probably nowhere in this favored land has she been so lavish of natural advantages as at Long Beach. Prominent among the special advantages given to Long Beach are the site for a magnificent harbor and the more than nine miles of coast line on the Pacific ocean, nearly all of which is a beautiful sandy beach. Much money has already been expended in improving these gifts of nature, but probably no one im-

provement has ever been undertaken that will so much enhance the beauty of the beach as the combined bulkhead and walk, with parapet, surmounted by clustered lights, which is designed to be constructed along the beach from Chestnut avenue to near the east jetty at entrance to harbor, a distance of 7,000 feet. The completion of this improvement will make possible the passage of a wheel chair without a jolt anywhere along the line from the pier at foot of Pine avenue to near the place where the shipping finds its way through the great bascule bridge to the inner harbor, on a smooth cement promenade 30 feet in width.

The plans for the proposed improvement contemplate a sea wall or bulkhead formed by a row of grooved piles of reinforced cement concrete driven into the sand to a depth of 14 feet below the grade of sidewalk, 12 feet apart. Between these piles and fitted into the grooves will be slabs of concrete 6 inches thick and extending to a depth of 12 feet below the walk. After placing the bulkhead, a cement walk 30 feet wide, with a parapet 30 inches high, will be constructed over the bulkhead and united with it by twisted steel rods and expanded metal, the whole forming a monolithic structure 7,000 feet in length. On the parapet, at intervals of approximately 100 feet, will be erected lamp posts of concrete, each supplied with two clusters of two 16-candle power electric lights, contained in ground-glass globes and supported by brass-covered arms.

It is estimated that the improvement will require 8,500 barrels of cement and 6,600 cubic yards of crushed rock and sand. For reinforcing the concrete there will be required 162,874 square feet of expanded metal and 8,316 feet of half-inch twisted steel rods. The lighting system will require 89 lamp posts, with 356 lamps, and the necessary wiring and other fixtures.

The work will be done under the immediate direction and inspection of the Board of Public Works of the city of Long Beach, F. S. Craig, president, and will be paid for according to the provisions of the bond act of 1899, the bonds to be serial, extending over a period of ten years, an even portion of the principal sum of which is payable on the second day of January of each year, by coupon, after their date, until the whole are paid, and to bear interest at the rate of 7 per cent. per annum, payable semi-annually on the second day of January and July of each and every year. The estimated cost of the improvement is nearly $100,000.

Plans and specifications for the proposed work have been prepared by the city engineer and adopted by the mayor and city council, and are now on file in the office of the city engineer.

E. P. DEWEY, City Engineer.
Long Beach, Cal.

LONGBEACH SEASIDE BOULEVARD.

An Outline of a Contract Between a City and a Water Works Company.

To the Editor of MUNICIPAL ENGINEERING:

Sir: Enclosed is a draft of suggestions for an ordinance recently presented to Champaign, Ill., which I read at the Indianapolis meeting of the Indiana Sanitary and Water Supply Association. I am informed that part of the Lake Forest ordinance was suggested by Mayor Jackson of Lake Forest. These suggestions were then added to by Mr. N. A. Partridge, attorney for the water company, and the matter was then thrashed out by the Council committee on one side and by Mr. Partridge, Mr. Holt, the president of the company, and Mr. John W. Alvord, consulting engineer, on the other. The ordinance recommended for Champaign

somewhat resembles the Lake Forest ordinance, but contains several important amendments.

DABNEY H. MAURY,
Consulting Engineer, Peoria, Ill.

Gas companies in Great Britain have for some years been operating with results apparently satisfactory to all concerned, under parliamentary enactments which, insuring a fair return on capital invested, secure for the consumers the benefit of skillful, economical and non-political management, combined with freedom from exorbitant rates.

As a means of settling a controversy over water rates in Lake Forest, Ill., the local water company recently proposed to the City Council the adoption of an ordinance based on the British plan; but the proposition was rejected by the Council.

In the event of any renewal of franchise to the water company in Champaign, I should strongly recommend the adoption of an ordinance resembling that proposed for Lake Forest.

The principal provisions of the ordinance which I should recommend for Champaign may be briefly stated as follows:

(1) All parts of the existing ordinance which relate to rates, appraisal, or purchase by the city, shall be repealed.

(2) The nature of the service to be rendered by the company shall be clearly defined, as well as the means for compelling compliance with its obligations.

(3) City shall have right to purchase the water works system at any time after six months notice to company of intention to do so, the price for same to be the present valuation, hereinafter called capital account, ascertained as hereinafter provided, together with such additions, if any, as may have been made after acceptance of the ordinance and prior to the date of said purchase.

(4) The value of the property shall be ascertained as of date of passage of the ordinance by three disinterested hydraulic engineers, to be selected by the city and by the company in such manner as may be mutually agreed upon, no one of whom shall be considered nor be the representative of the interests of either the city or of the company.

The valuation to be based on the ascertained present value of the plant considered as a going concern. If the existing rates are found to be too high or too low, to pay the correct interest on the investment, the item of going value to be figured on the assumption that the actual water takers paid proper rates. The cost of the services rendered by the board of engineers, and the other necessary expenses connected with the appraisals, shall be added to the valuation and form part of the capital account.

In connection with the valuation, the cost of the installation and of the subsequent operation of a plant for removing iron from the water supply shall be estimated by the board, and the city shall have the option of requiring the installation of said plant by said company; and in case the city shall elect to have said plant installed by said company, the cost of the said installation shall be added to the valuation and included in the capital account.

(6) The same board of engineers shall fix the rates to be charged so long as the ordinance remains in force, the said rates to be sufficient to cover the following items:

(a) Operation and ordinary maintenance and repairs.

(b) The establishment of a fund or surplus sufficient to pay for all necessary replacements or renewals from time to time during the term of the ordinance.

(c) The payment to the company of a reasonable and proper rate of interest upon the capital account or valuation fixed as hereinbefore set forth, when additions thereto, if any, made in accordance wtih the provisions hereof.

(d) The establishment of a sinking fund sufficient to cover capital account, with additions thereto, if any be made between date of passage of ordinance and its termination, whether by expiration or purchase.

(7) In case the rates so fixed shall produce in any year or terms of years an amount substantially greater than sufficient to meet the above four requirements, then such excess shall be divided, the city taking one-half and the company one-half; provided, however, that the city may, if it so elect, pay its half of the excess to the company, in which case a like amount shall thereupon be deducted from the capital account, and a proportionate deduction shall thereafter be made in the interest and sinking fund based on said capital account.

(8) Whenever replacements and renewals to plant and equipment shall become necessary, the necessary cost thereof shall be paid out of the replacement and renewal fund above provided for. If the amount in such fund be not great enough to cover said cost when the same may be incurred, the company shall advance the deficiency, which amount so advanced, together with interest thereon at 6 per cent per annum until paid, shall be repaid out of said fund to said company.

(9) Either party shall have the right to have rates revised and determined after sixty days notice to the other, but not oftener than once in any one year. Said notice having been given and received, a board .of three hydraulic engineers shall be appointed as hereinbefore specified, to perform the same duties in ascertaining and fixing the rates, and shall be paid as hereinbefore provided.

(10) Whenever any substantial increase, enlargement, alteration, extensions or additions to said plant shall be desired by said city, the same shall be made either by said city by special assessment or otherwise, in case said city shall elect to

do so, or by the company in case city should so elect. In case any such change is made by and at the expense of the city, the cost and expense of the operation and maintenance thereof, together with the necessary replacements and renewals thereto, shall be paid out of and deducted from the income of said company, nor shall any addition to the capital account of said company be made on account thereof.

In case any such change be ordered by the city to be made at the expense of the company, then the necessary cost thereof shall be paid by the company and the amount of said cost shall be added to capital account, and from the time said added cost is incurred interest shall be paid thereon at the rate hereinbefore fixed for interest on capital account, and the sinking fund shall be increased proportionately to provide for the retirement of said cost.

(11) Should the city not elect to purchase the plant prior to thirty years from the date of acceptance of this ordinance, then at the end of said thirty-year period the sinking fund shall be used to pay off and retire the then outstanding capital account of the company, and the water works plant shall thereupon belong to and be the property of the city without further payment therefor.

Should the city elect to purchase the water works plant at any time after this ordinance takes effect, upon notice as herein provided, then the amount in said sinking fund up to the time of purchase, shall, in like manner, be applied to the payment of said capital account, and the city shall be liable to pay only the difference between the amount of said capital at that time and the amount then accumulated in the sinking fund. In case any surplus remains in the renewal and replacement fund at the time of said purchase, the same shall be divided and shall be paid, one-half to the city and one-half to the company.

(12) The company, so long as it continues to operate under this ordinance, and on or before the 15th day of February of each year, shall prepare and file with the city clerk an annual report for the preceding year ending on the 31st day of December. Said reports shall be properly verified and shall set forth with reasonable detail, according to forms prescribed by the board of engineers, character and amount of business done, the amount of receipts and the amount of expenses, and the city clerk, under the order and direction of the mayor and City Council, shall have the right at all reasonable times to examine the books, vouchers and records of receipts and expenditures of the company for the purpose of ascertaining the accuracy of the reports herein referred to, and the rights of the city under the ordinance.

There shall also be an annual audit of the company and a formal written report by public accountants selected by the city and the company, the expense of said audit and report to be paid out of the gross receipts of the company as an operating expense. In the event of any purchase of the water works under the provisions of this ordinance, there shall be an account and report for the preceding six months similar in character to the annual report hereinbefore provided for.

(13) The company shall not remove its principal office nor any of its books (except bond register and stock transfer books), records, accounts, contracts or original vouchers of receipts and expenditures, beyond the limits of said city, so long as it continues to operate any portion of the water works provided for under this ordinance.

(14) Within thirty days from and after the passage of this ordinance, the company shall file with the city clerk of the city of Champaign an acceptance thereof in writing, signed for the company by its officers who are authorized to do so, and thereupon this ordinance and such acceptance shall become and be a contract between the said company and the city of Champaign.

(15) This ordinance shall take effect and be in force from and after its passage and publication once in the local daily papers of Champaign.

Some of the obvious advantages of the ordinance outlined above are as follows:

The provision that no one of the arbitrators shall be a representative of the interests of either party eliminates that undesirable partisanship almost unavoidable when two of the members of a board of arbitration consider themselves as representatives of one interest or the other, and makes them, in effect, judges instead of advocates.

The provisions in regard to the basis for the valuation would seem to be eminently fair, for it is only just on the one hand that the company should have the benefit of the value of the business which its skill and industry have worked up, and on the other that if the income derived from its business be too high on account of excessive rates hitherto enjoyed, or too low because of rates that have been insufficient, then the going value should be based on the receipts at proper rates from actual water takers secured by the company.

The provisions for ordinary maintenance and repairs, for a fund for necessary replacements and renewals, and for the establishment of a sinking fund to cover capital account, are manifestly proper.

The provision for the division between the two parties of the contract of any excess in net earnings over the fair rate of interest on capital account fixed by the appraisers makes the city a sharer in the profits and at the same time maintains the incentive to economical management on the part of the company.

The desirability of the provisions in re-

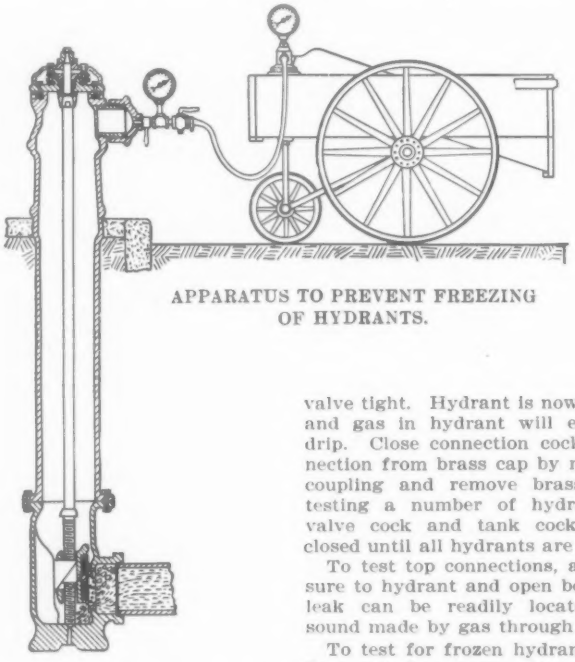
gard to the establishment of a proper system of bookkeeping, and for publicity of accounts of receipts and expenditures, is so obvious as to need no comment.

It is commonly recognized that in view of the hazards of water works business under existing laws and ordinances, and especially in view of the menace inherent in 'the rate regulating power of cities, capital invested in water works is fairly entitled to return at least 3 or 4 per cent more than the rates customary on safe investments; but with these hazards almost entirely removed, as would be the case under an ordinance of this character, the investment and its returns would be practically guaranteed, and a water company should therefore be willing to accept a rate of interest considerably lower than that to which it might be entitled with the form of ordinance heretofore in vogue.

Protecting Hydrants from Freezing.

To the Editor of MUNICIPAL ENGINEERING:

Sir—Following is the method of applying the Cowles & Clark method for inspecting fire hydrants and preventing their freezing stated in more detail than was given in the March number, page 181, with a drawing to show the steps described:



APPARATUS TO PREVENT FREEZING OF HYDRANTS.

Fire hydrants should be tested and cleared, leaky bottom valves, packing glands and caps repaired and made tight at the beginning of winter.

To test hydrant, remove cap from one outlet, screw on brass cap accompanying apparatus. When cap is screwed up, connect air hose by means of quick coupling. Close connection cock. Open tank cock 3 turns. Tank gauge will show pressure for which reducing valve is set (adjustment of this gauge should not be disturbed after once set). Open reducing valve cock one-half turn. Open connection cock, and if drip is unobstructed gas will pass freely out through drip, and pressure will not rise to pressure shown by reducing valve gauge. If hydrant contains water, pressure indicated by connection gauge will stand high until water in hydrant is forced out through drip, then pressure will drop.

To test main valve, shut off gas at connection cock after testing drip valve; open main or bottom valve of hydrant. Open connection cock and gas pressure will force back into main any water which rises in hydrant. This clears the valve seat of obstructions and permits valve to be closed tight. Any excess gas entering hydrant will escape into water main and pressure on connection gauge will stand at pressure of water, which will probably be slightly below pressure indicated on reducing valve gauge; then with connection cock open and gas pressure on hydrant, close bottom valve tight. Hydrant is now free of water, and gas in hydrant will escape through drip. Close connection cock, remove connection from brass cap by means of quick coupling and remove brass cap. When testing a number of hydrants, reducing valve cock and tank cock need not be closed until all hydrants are tested.

To test top connections, apply the pressure to hydrant and open bottom valve; a leak can be readily located by hissing sound made by gas through leak.

To test for frozen hydrants, if pressure does not drop soon after the connection cock is opened, it indicates that drip valve is obstructed or that a plug of ice has formed in the barrel of the hydrant. If bottom valve of hydrant is opened and reduction of pressure on connection gauge shows immediately, it indicates that drip is closed but that the hydrant was free of water so that the gas immediately escaped

into the main. If two or more seconds are required before gauge pressure drops, it indicates hydrant contained water which had to pass back into the main before the gas could escape and reduce the pressure. If pressure does not fall with main valve open, it indicates that ice prevents passage of gas, and the full pressure will show on both gauges.

After a hydrant has been in use the gas pressure should be immediately applied, as per above instructions, to force water out of hydrant.

All caps on hydrant should be fitted with gaskets and screwed tight. Packing glands at top of valve stem must also be practically air-tight.

A small leak at top of hydrant will not prevent gas pressure from forcing water from hydrant, but a large leak will. Hydrants in bad condition should be immediately repaired.

In testing hydrants which are equipped with drip outlets, any water accumulated in the hydrant should be blown out through the drip valve before the main valve is opened.

Hydrants set in marshy ground should have drip outlet plugged and bottom valve kept in order so it will not leak. Water contained in hydrant after use should be forced back into main.

When the pressure tank is empty, disconnect by unscrewing coupling between reducing valve and pressure tank, replace empty tank with full one, insert new fiber washer which is attached to tag when the full drum is delivered; screw connection up tight, and proceed as directed.

When the emperature is below freezing, all hydrants should be inspected daily.

E. H. COWLES, New York.

MUNICIPAL MATTERS IN COURT

Decisions of Higher Courts — Automatic Sprinkler Damage — Chicago Street Railway Profits—Condemnation of Sewage Plant Site

Decisions of the Higher Courts of Interest to Municipalities.

Prepared by JOSEPH W. KENNEY, ATTORNEY, INDIANAPOLIS, IND.

Streets—State Highways.—Streets are state highways kept open for the benefit of the state and not the municipality; the municipality being an agent of the state respecting them. (In re Low, [N. Y.] 112 N. Y. S. 619.)

Validity of Ordinance.—Whether an ordinance is reasonable or unreasonable is a question to be determined by the court, having regard to all existing circumstances or contemporaneous conditions. When an ordinance is plainly unreasonable and prohibitive in its character, the courts may interfere and pronounce it invalid. (Endelman v. City of Bloomington, 137 Ill. App. 483.)

City's Contract to Purchase Water Machinery.—A city contract to purchase water machinery was not authorized by any ordinance, resolution or order of the City Council, as required by Kirby's Dig. Sec. 5473, and was not ratified by any formal action of the Council. Though such contract was void for want of action by the Council, where the machinery was delivered, retained and used by the city for nearly two years, the city thereby accepted the machinery and the contract became executed by the seller, making the city liable for the price. (Forrest City v. Orgill Bros. & Co. [Ark.] 112 A. S. 891.)

Franchise Does Not Prohibit Similar Grants.—A city granting a franchise to furnish light and heat by means of natural gas, may grant a similar franchise to some other person or corporation, unless the first franchise was made exclusive in express terms. (Town of Sapulpa v. Sapulpa Oil & Gas Co. [Okla.] 97, p. 1007.)

Dynamite Exulosion in Street.—New York City is not liable for an explosion of 200 pounds of dynamite stored in a street by a sub-contractor, in constructing a section of the rapid transit subway, even if a permit given by the fire commissioner for the storage of 50 pounds of dynamite was valid. (Murphy v. City of New York, 112 N. Y. S. 807.)

Obstruction in Street.—An obstruction placed in a street with or without municipal permission, and there negligently maintained, which causes injury, confers a cause of action. (Kenyon v. Chicago City Ry. Co. [Ill.] 85 N. E. 660.)

Negligence of City—Iron Cover of Coal Hole—Damages for Injury.—The maintenance by a city of a slippery iron cover of a coal hole in a sidewalk is actionable negligence.—Smith v. City of Tacoma (Wash.), 98 P. 91.

Draining Sewage Into a Stream—Rights of a Village.—A village through which flows a stream, being the owner of the dominant heritage, may collect its surface waters and have them pass by way of the stream through the land of a lower owner, so long as it does not cast its sewage on his land and thereby create a nuisance, and this though it incloses the stream within the village, and collects and conducts to it the surface water by underground tile drains instead of surface ditches.—Crane v. Village of Roselle (Ill.), 86 N. E. 181.

Modification of Franchise by Ordinance.—The relation between a city and the owner of an existing telephone franchise, being quasi contractual for the performance of a service, an ordinance modifying the terms of the franchise for the purpose of securing more effective service in competition with the owner of another franchise is not invalid as releasing an indebtedness or liability to the municipality in violation of Const., sec. 52.—Louisville Home Tel. Co. v. City of Louisville (Ky.), 113 S. W. 855.

Assessment of Lot of Variable Width.—A lot widening from a 50-foot frontage to 175 feet at the rear, and lying within the quarter square, is wholly taxable for an abutting street improvement, and not merely the part lying between parallel lines extending back at right angles to the street 50 feet apart.—Hallen v. Barber Asphalt Paving Co. (Ky.), 113 S. W. 516.

City's Liability for Injury from Trench in Street.—That a trench in a city street which had been filled by the city was filled the same as it had filled all such holes in streets would not relieve the city from liability for an injury occasioned thereby, since the manner in which the city ordinarily filled such holes was not a standard of safety.—Heberling v. City of Warrensburg (Mo.), 113 S. W. 673.

City Must Examine Wooden Sidewalks.—A city must take notice that constant use will wear out a wooden sidewalk, that nails will pull and supports decay in a few years, and it is not enough that the surface of the walk appears sound, but it must be examined and kept in repair.—Billings v. City of Snohomish (Wash.), 98 P. 107.

Damages Cannot Be Collected for Automatic Sprinklers Operated by Sun's Heat.

By dismissing the case of John N. Bagley, of Detroit, Mich., vs. the National Fire Extinguisher Company, of New York, the United States supreme court virtually decided in favor of the company. The plaintiff, John N. Bagley, owns a large store building in Detroit. In an effort to protect his building and the lessees of it against fire, he installed automatic fire extinguishers, which release water through the fusing of the closers of sprinkler heads. The contract provided that these closers should melt whenever the temperature should reach 155 degrees Fahrenheit. In 1897, July 4 was an exceptionally warm day, and the concentration of heat under the skylight caused the sprinkler heads to melt, in the absence of fire, and the water released damaged the building and its contents. The owner of the building brought suit to recover, but the United States court of appeals for the second circuit decided against him, on the ground that the extinguisher company had complied with its contract and was not responsible for the damage.

Chicago's Share of Street Railway Profits Must Be Used to Purchase the Roads.

In a decision handed down in the circuit court in Chicago, March 2, by Judge Thomas G. Windes, municipal ownership achieved a victory. Judge Windes ruled that the moneys accumulating from the city's 55 per cent. of the net profits from the Chicago City Railway Company cannot be used by the city for any purpose except to form a sinking fund for the purchase of the two great street railroads when their franchises expire in eighteen years. The fund will have to be preserved for the ultimate purchase of the traction properties, and cannot be depleted for the payment of salaries or other current expenses.

Condemnation of Public Property for Sewage Disposal Plant.

In an opinion filed in the New Jersey supreme court by Justice Garrison, March 5, he decided in favor of the borough of Madison in its proposed plan of establishing a sewage disposal plant and filtration beds in the borough of Florham Park. The court considered jointly in the decision four suits, and three of these were instituted against the borough of Madison, the respective complainants being the borough of Florham Park, Leslie D. Ward and Edward S. Toothe. An attack was made in the suit upon the order of Justice Parker appointing commissioners to condemn the lands necessary for the disposal plant in Florham Park. The principal contention in the three suits mentioned was that the lands in question had already been deeded to the borough of Florham Park for use in connection with the establishment of a public water supply. The complainants relied upon the statutory provision that grounds dedicated for one public use cannot be condemned for another public purpose. The court finds, however, that this contention cannot be sustained in the present instance, because, although the lands were deeded to Florham Park with the understanding that they would ultimately be used in connection with its water supply,

the municipality has taken no steps under the law to devote them to such a use.

The court holds, therefore, that they are as much subject to condemnation at the hands of the borough of Madison as though they were still held privately. One of the important questions raised in the litigation is the validity of the proceedings upon which the proposed condemnation was based. Since that time, however, this point has been disposed of by the court of errors and appeals in a recent decision sustaining the right of Morristown to erect a sewage disposal plant within the corporate limits of the township of Hanover.

The fourth litigation considered by Justice Garrison was instituted by the borough of Madison against the borough of Florham Park, and sought to set aside a deed for the lands in question made by Edward Toothe to Florham Park and the acceptance of the deed by the borough. Justice Garrison says it is not necessary, in sustaining the borough of Madison, to hold that the conveyance is invalid, and that in fact the present proceeding is not the proper one in which to test the legal effect as between the parties of a conveyance made in due form.

REFUSE DISPOSAL

New York Harbor Pollution—Refuse Destructor and Power Plant

Pollution of New York Harbor.

Horace Loomis, chief engineer of sewers of the borough of Manhattan, does not believe that the harbor is sufficiently polluted to warrant the introduction of sewage disposal plants by the city. In a letter to Edward Hatch, Jr., acknowledging the receipt of the plans for water front disposal plants, he has expressed this opinion. These plans were prepared by an engineering firm, in accordance with Mr. Hatch's suggestions, and submitted by the mayor to Mr. Loomis.

Mr. Loomis does not entirely agree with Mr. Hatch in his statement to the mayor that the conditions along the water front are intolerable. The discharge of sewage, he says, is at the outer end of piers some 600 or 800 feet from the bulkhead line in deep water and swift currents, where it is speedily assimilated and digested. He quotes passages from the 1905 report of the New York Bay Pollution Commission to show that the waters of the bay "in general are not so polluted as to be offensive to the senses, though such is the case with its estuaries and smaller bays."

The sanitary authorities of the city have given respectful consideration to the plan suggested by Mr. Hatch and his engineering advisers. Mr. Hatch answered Mr. Loomis, March 19, as follows:

It is not necessary to be an expert to know that the waters around New York are polluted. Passengers on the steamers all know of the unsightly and intolerable conditions along the water front, and even to the middle of the river. One of the commissioners, whose report Mr. Loomis quotes, tells me that there are only 10 per cent. of the sewer outlets that extend to the pier head line, and that most of the sewage remains in and under the wharves, where flies gather from it the germs of disease. The same report showed that nearly 400,000 tons of sludge from sewage was deposited annually upon the bottom of the harbor. The officers of boat and yacht clubs about New York advise me of most intolerable conditions, and say that their members cannot bathe from their floats without danger to health, particularly to the eyes and ears, to say nothing of the damage to the boats by the filth carried by the waters. The coach of the Columbia crew has actually forbidden his men to bathe in the part of the Hudson on which they take their prictise.

A Combined Refuse Destructor and Generating Plant.

The recently completed generating station at St. Albans, Herts, England, is in the almost unique position of being a steam generating station exclusively dependent on refuse for fuel. It forms one of the small separate stations owned by the North Metropolitan Electric Power Supply Co., which have been established in some of those isolated parts of its large area of supply (326 square miles), which it would not have been economical to reach by extensions of mains. The company also owns a station constructed for similar reasons at Hertford. By an arrangement with the Corporation of St. Albans, the company dispose of the whole of the town refuse, which is dumped direct into a hopper delivering on to the floor of the destructor house by the corporation dust-carts.

The station is adjacent to a branch line of the Great Northern Railway, within half a mile of the St. Albans station of the Midland Railway. An inclined roadway, laid with wooden sleepers in order to give the horses a firm footing, leads from the road to an elevated covered-in platform at the back of the station. Here the carts of refuse are first weighed on a Pooley weigh-bridge with ticket-printing attachment, and are then backed against the edge of a chute which extends almost the whole width of the station. The refuse is dumped into this chute and is delivered on to the destructor house floor below, from where it is fed by hand into the furnaces. Old iron is, of course, sorted out by the

stokers, and any bulky objects, such as large mattresses or animal carcases, are cremated separately in one of the combustion chambers. On either side of the main refuse hopper is a small coal-bunker, containing a small store of cheap coal of the class known as "yard sweepings." This is provided for the purpose of mixing with the refuse occasionally, when the material is very wet or contains a large proportion of garden refuse.

The building is constructed in three main bays. The destructor furnaces, boilers, and pumping plant occupy the rear bay; the center accommodates the generating sets and switchgear; and the front portion is devoted to the battery-room, test-room and offices. The generating plant comprises at present two 150-kw. sets. The arrangement of the boilers at right angles to the destructor furnaces has resulted in a very compact design for this portion of the plant. The whole of the machinery and switchgear is quite shut off from the destructor plant, so that dust troubles are entirely obviated.

The destructor plant was supplied by Messrs. Heenan & Froude, Ltd., and consists of two units of three cells each. Each unit is capable of burning from 25 to 30 tons of refuse per day of 18 hours. The cells and combustion chambers are lined with 9 inches of fire-brick. Regulating valves for controlling the forced draught to each section of the grate independently are provided; and these are worked by means of small levers near the furnace doors. The latter are of the balanced sliding pattern. In order to permit of the destruction of mattresses, animal carcases, and other large articles, the doors of the combustion chambers, of which there are two, are 3 ft. wide by 4 ft. 6 in. high.

The chimney is 130 ft. in height, and has an internal diameter at the top of 5 ft. 6 in. To provide forced draught for the furnaces a "Heenan" centrifugal fan, running at a speed of 450 r. p. m., is used, driven either electrically or by steam. On one side is a vertical steam engine of the totally enclosed type, fitted with forced lubrication; this engine is connected to the fan by means of an ordinary flange coupling. On the other side is a 460-volt Rhodes ventilated type motor, which can be coupled to the fan by means of a sliding clutch when required. This motor is designed for a 50 per cent. speed variation by shunt regulation; the starting and regulating gear is attached to the wall just below the platform on which the forced draught plant is mounted. The platform is alongside the flue, projecting into the engine-room, but entirely separated by means of steel plates from the destructor house, so that no dust can reach either engine or motor. The air for the fan is taken in at the top of the destructor house, and after passing through the air-shaft and the fan, it is heated to a temperature of about 350 degrees F. by being passed through an air-heater, which consists of a number of boiler tubes through which the flue gases pass. The heated air is then passed through ducts to the front of the furnaces. Good ventilation of the destructor house is insured, as fresh air is drawn in at the doorways and through special openings provided at the ground level, to replace that which is removed from the top of the building by the fan. This special feature of the Heenan destructor insures that any smoke or fumes which may have collected in the destructor house pass through the furnaces a second time.

Each of the two Babcock and Wilcox boilers has a heating surface of nearly 2,000 square feet, and is composed of twelve sections of eight tubes each, and doors are provided in the side of the building, so that the tubes can readily be drawn when necessary. Each boiler is provided with a "Foster" superheater, capable of raising 7,000 lbs. of steam per hour, at a pressure of 200 lbs. per sq. in., to a temperature of 507 degrees F., corresponding to a superheat of 120 degrees F. These superheaters consists of a series of steel tubes fitted with annular gills or flanges to equalize the temperature. Each of these tubes has a centrally-supported core or closed tube, so that the steam, while receiving the superheat, passes along an annular space. The main and bye flues are provided with doors for access for cleaning. Two swivel dampers are fixed in the outlet to each boiler, and two balanced sliding dampers are provided in the bye flues; so that either destructor can be used when its boiler is shut down. There is also a sliding damper in the flue to the chimney. A guarantee was given by the makers of the destructor plant that 1.69 lb. of water from and at 212 degrees F. would be evaporated per lb. of refuse burnt, at a pressure of 200 lbs. per sq. in., and at a temperature of 507 degrees F. A pressure of 200 lbs. per sq. in. was decided upon in order to take full advantage of the steam raised, so that blowing off would occur as seldom as possible. As a certain amount of blowing off is unavoidable, a relief valve it fitted at one end of the main steam range, and pipes are connected to it which allow the excess steam to pass to an injector heater in the feed tank, which not only increases the economy, but enables the water to be returned to the boilers. The amount of steam consumed by the engine for the forced draught set was specified as from 5 to 6 per cent. of the total amount generated. Refuse clinker is, of course, a useful bye-product, as is also the fine hard dust collected from the combustion chambers, which makes an excellent mortar.

The two engines are of the Brush-Falcon two-crank compound enclosed type, running 430 r. p. m., and are at present run non-condensing, although it is intended to put in condensing plant at a future date. It is possible, however, that

the exhaust steam will be utilized for the heating of a large factory and printing works adjacent to the station. The guaranteed steam consumption is 28.5 lbs. per kw. hr. at full load, with 175 lbs. per sq. in. pressure at the stop-valve and atmospheric exhaust. The pump room is situated above the main flue adjacent to the chimney, and contains a Mather & Platt three-throw variable stroke electrically-driven pump and a Wier steam pump. A water-softening plant is shortly to be installed.

Each engine drives two 75-kw. continuous-current generators in tandem. These are four-pole Brush machines generating at 230 volts, one on either side of the 460-volt three-wire system. One of the problems which confronted the engineer when designing the station was the fact that, whereas a pressure of 460 volts had been decided upon for the town, the large factory and printing works already mentioned, which it was also intended to supply, had already a 115-volt system with its own generating plant. In order to obtain a 115-volt supply, the generator armatures are fitted with two slip-rings connected to opposite points in the winding, and these are connected through double-pole switches mounted on the machine frames with compensators. A tapping is taken out from the neutral point of each compensator, so that the direct-current voltage between either terminal and the tapping is 115 volts if the total pressure across the machine in question is 230 volts. Connections from the tappings of the two compensators and from the common and outer terminals of the generators thus constitute a five-wire system, from which the supply to the adjacent factory can be given. As the declared pressure in the town is 460 volts, and the station pressure may be as high as 480 volts at full load, provision is made to supply the difference between this and the total generator pressure of about 460 volts by boosters. For this purpose the generators are connected to "low-pressure" bars on the switchboard and the outgoing cables to the "high-pressure" bars, and the boosters are connected between the two sets of bars. The 115-volt supply can be given by using a booster set as a motor-generator set, in which case the generators can be connected direct to the "high-pressure" bars. The main switchboard is of Messrs. Ferranti's make, and consists of enamelled slate panels supported on an angle-iron framework. Between the board and the wall is a passageway quite four feet wide, so that the back connections are easily accessible.

The battery room contains 268 cells arranged in one tier, but in two groups of 134 each. The cells, which are of the Tudor Company's make, have a capacity of somewhat over 1,000 ampere hours at a 10-hour discharge rate. Lead-lined wooden boxes are used, and these are supported on glass insulators, the whole being raised from the ground on a wooden stand. Some of the cells of each group are connected to the discharge regulating switches, which are operated by chaingear. Provision has been made for a bell connection, which will indicate when the switch arm is in an intermediate position. In order that the switchboard attendant may know in what position the switch arm of the regulating switch is, the shaft of the operating handle is provided with a screw-thread and a nut which travels along and indicates on an adjacent scale the number of cells in circuit. Ampere-hour meters to record the charge and discharge separately are provided. The station lighting is controlled from a small panel at the back of the main board. All wiring is carried out with lead-covered twin wire.

ORGANIZATIONS AND INDIVIDUALS

Wisconsin Engineers — Technical Meetings — J. C. Wonders — Civil Service — Refuse Disposal Bibliography — Papers on Paving — Personal Notes

Engineers of Wisconsin Form State Society.

The organization of the Engineering Society of Wisconsin was completed at the first meeting, held at the University of Wisconsin, February 24, 25, 26, at which some 150 city engineers, general managers of power and traction companies, contracting engineers, superintendents of water and light plants, mechanical and civil engineers and superintendents of highway construction were present and became charter members.

The officers elected were: President, Dean F. E. Turneaure, University of Wisconsin College of Engineering; vice-president, City Engineer McClellan Dodge, of

Appleton; trustees for two years, B. F. Lyons, assistant general manager of the Beloit Gas and Electric Co., and E. P. Worden, mechanical engineer of the Prescott Steam Pump Co., Milwaukee; and trustee for one year, E. Gonzenbach, of the Sheboygan Electric Light and Power Co., and City Engineer E. R. Banks, of Superior. These, as executive board, will elect the secretary later.

The new organization will hold annual meetings. The program included a presentation of the state highway work by W. O. Hotchkiss and A. R. Hirst, the latter speaking on the use of tar, oils and emulsions on macadam and earth roads. A discussion on pavements by McClellan Dodge, city engineer of Appleton, P. H. Connolly, city engineer of Racine, W. G. Kirchoffer, consulting engineer, Madison, and others. City Engineer C. V. Kerch, of Janesville, spoke on the construction of the Court street bridge in that city.

Conservation of forests elicited prolonged discussion by State Forester E. M. Griffith, Senator T. W. Brazeau, Senator E. E. Brown, Assemblyman J. R. Jones and Prof. D. W. Mead.

Prof. W. D. Pence described the organization of the railroad commission's engineering staff. The problem of standards of gas and electric service was discussed by Prof. C. F. Burgess, of the university.

Electric interurban roads was the subject of F. G. Simmons, of the Milwaukee Electric Railway and Light Co. The day circuit for small towns was discussed by Prof. J. W. Shuster, and new forms of arc lamps by W. E. Wickenden, also of the electrical engineering department.

W. G. Kirchoffer described the water supply of the city of Marshfield, Prof. D. W. Mead hydraulic and hydroelectric power development, and Prof. L. S. Smith the water power resources of the state. Papers on the waterproofing of concrete, by F. M. McCullough, city engineer of Stoughton; municipal engineering in the Orient and in Porto Rico, by J. T. Hurd and Edwin Wray; gas producers and small power stations, by V. E. McMullen, Beloit, and C. T. Atkinson; and Madison's concrete storm sewer system, by City Engineer John F. Icke, concluded the convention program.

Technical Meetings.

The thirty-second annual convention of the National Electric Light Association will be held at Atlantic City, N. J., June 1, 2, 3 and 4.

The next annual convention of the American Water Works Association will be held in Milwaukee, Wis., June 8 to 12. John M. Diven, secretary, 14 George st., Charleston, S. C.

At the meeting of the American Society of Civil Engineers held March 17, L. R. Gifford presented a paper on "Steel Sheeting and Sheet-Piling" for discussion.

The cement users of Oklahoma held a convention in Oklahoma City, February 9, 10 and 11. In a paper on "Manufactured Portland Cement and Its Relation to the Development of Oklahoma," W. L. Whitaker dwelt on the advantages of the new state of Oklahoma over the older states in the matter of constructing permanent railroad bridges, and also called the attention of the farmer to the advantages of everlasting cement fence posts, concrete storm and root cellars, silos, hog pens, chicken houses, etc. Among other popers submitted were the following: "Concrete Telegraph, Telephone and Electric Light Poles," by Frederick H. Tidman; "Are Concrete Blocks to Be Relied Upon for General Construction?" by L. E. Simmons; "Failures in Concrete and How to Remedy Them," by H. G. Newcomb; "The Manufacture of Concrete Blocks," by E. M. Walton. As a result of the convention the Oklahoma Cement Users' Association was organized and constitution and by-laws adopted. D. C. Patterson was elected temporary chairman and F. W. Carlin, of Pawnee, temporary secretary. The constitution provides for vice-presidents, and the following were elected: P. T. Tarwater, of Frederick, first vice-president; H. G. Newcomb, Shawnee, second vice-president.

An Illinois Fuel Conference was held at the University of Illinois March 11, 12 and 13, in connection with the opening of the Urbana, Ill., branch of the U. S. Geological Survey mine rescue station, which is operated under the charge of the Illinois State Geological Survey. Numerous papers on mines and mining and on fuels were presented by experts from the two surveys, and mining and fuel engineers, inspectors and others in Illinois and the adjoining states.

The Ohio Association of Contractors has opened a permanent office in the First National Bank building, at Columbus, Ohio in charge of Arthur J. Thatcher, secretary and treasurer. The officers of the association are: President, O. P. Rieley, Columbus; vice-president, William M. Graham, Columbus; trustees—James E. Conley, Dayton; Edward Kelley, Portsmouth; William J. Wildes, Akron; L. A. Fauvre, Lorain; Thomas J. Milligan, Lima; William H. Adams, Zanesville; W. H. Luchtenberg, Columbus.

The Merchants' Association of New York has re-elected Henry R. Towne as president and S. C. Mead as secretary.

At the March 11 meeting of the Brooklyn Engineers' Club, Hugh T. Wreads presented a paper on "Fire Hazard and Fire Protection in the United States." The weekly informal library talks recently instituted included during March one by Emil Kuichling on "Rainfall and Run-off in Relation to Sewer Design," one by E. W. Clarke on the "Water Works and Sewer System of the Panama Canal Zone," and one by J. H. O'Brien and Schuyler Hazard on "The Pennsylvania Railroad Tunnel."

At the March meeting of the New England Water Works Association papers were

presented by Joseph C. Pelletier on "Civil Service in Its Application to the Water Department," by Carroll F. Story on "The Ludlow Filters," and by William S. Johnson on "Ground Waters as Sources of Public Water Supplies."

Burton J. Ashley, C. E., 6515 Normal boulevard, Chicago, Ill., the inventor of a residential septic tank, has been prominent in the campaign to retain Normal boulevard under the park department.

James C. Wonders.

James C. Wonders, C. E., Ohio's Highway Commissioner, was born on a farm in Logan county, Ohio, in 1860, and received his education in the public schools of Zanesville, the Lebanon Normal School and the Ohio State University. He is a born and bred Ohioan.

His work as a civil engineer began in 1883, when he served for one year as deputy surveyor of Logan county. Since that date, and in addition to his private practice, he has served thirteen years (1884-90 and 1894-1901) as city engineer of Bellefontaine and twelve years (1888-94 and 1900-06) as county engineer of Logan county.

J. C. WONDERS, C. E.
State Highway Commissioner, Columbus, O.

He surveyed both the Lewiston and the Grand reservoirs for the Ohio Canal Commission, and has served the State Board of Public Works on the Miami river improvement, the construction of revetment walls along the Miami and Erie canal in the city of Cincinnati, the improvement of the Grand reservoir embankment and the improvement of the Miami and Erie canal from Cincinnati to Toledo.

During the period of his service as engineer of Logan county Mr. Wonders built about 500 miles of improved highways ranging in cost from $2,000 to $5,000 per mile. This experience has aided him in getting into close contact with his duties in the state department, and he has succeeded in doing much excellent work under some rather discouraging conditions.

Civil Service Examinations.

The U. S. Civil Service Commission will hold examinations in the usual places as follows:

April 14, 15: Mechanical draftsman, first class at $150, second class at $125, topographical draftsman at $125 and tracer at $100 a month in the Isthmian canal service.

April 21, 22: Tracer of mechanical drawing in the Isthmian canal service at entrance salary of $100 a month.

Information on Refuse and Garbage Disposal.

The Carnegie library of Pittsburg has reprinted from its January bulletin a bibliography of refuse and garbage disposal, giving descriptive titles of books and articles in periodicals on the subject which are on file in the library. The list is carefully classified and will be of great value to any one studying the subject. MUNICIPAL ENGINEERING has its fair share of entries in the lists.

Papers on Asphalt and Wood Pavements.

Mr. N. P. Lewis, chief engineer of the Board of Estimate and Apportionment in New York City, was a delegate to the first international road congress, held in Paris last October. He thinks so highly of a paper by M. P. Tur on methods of laying and maintaining wood and asphalt pavements in Paris, and of one by Louis Magerolle upon the future of exotic woods as applied to pavements, that he has had them translated and printed in a pamphlet published by the mayor of the city of New York. They are certainly valuable papers upon these subjects, and can probably be obtained from Mr. Lewis upon request.

Personal Notes.

John A. Jones has been elected city engineer at Lewiston, Me.

E. B. Cauthorn has resigned as city engineer at Columbia, Mo.

Rodney A. Swift has been re-elected city engineer at Auburn, Me.

C. L. Peckinpaugh has resigned as city engineer at Sheffield, Ala.

Thomas Watts, Jr., has been elected mayor at Coal Creek, Tenn.

O. J. Dempster has been re-elected city engineer at Little Falls, N. Y.

Charles M. Slocum has been re-elected city engineer at Springfield, Mass.

C. R. Allen, city engineer of Ottumwa, Iowa, died in that city February 28.

Howard J. Cole has been appointed street commissioner at Morristown, N. J.

Hon. John F. Woodman has been re-elected mayor at Bangor, Me., for the third term.

L. C. Wright has been re-elected superintendent of water works at Northampton, Mass.

F. B. Rogers has resigned as consulting engineer of the water board at Newburgh, N. Y.

Hon. John Boyd Thacher, former mayor of Albany, N. Y., died recently, after a long illness.

L. V. Gaffney, of Concord, N. C., has been elected superintendent of water and lights at Gaffney, S. C.

Alfred Taggat, former mayor of Rockford, Ill., died at the home of his son in LaGrange, Ill., March 12.

John William Ewing, the first mayor of Princeton, Ind., died in that city recently, of apoplexy, aged 59 years.

Archibald O. Powell has established an office as consulting civil engineer in the Central building, Seattle, Wash.

Major Christopher Harrison has been appointed city engineer at Everett, Mass., for the eleventh consecutive year.

Dr. Joseph R. Owens, mayor of Hyattsville, Md., died at his home, Hilltop Lodge, in that city, March 16, aged 70 years.

Hon. Frank W. Duncan, mayor of Petersburg, Ill., died in that city recently, after a lingering illness, aged 70 years.

William Kolacek has been elected president of the West Park Board at Chicago, Ill., to succeed John F. Smulski, resigned.

D. N. Cook was unanimously re-elected superintendent of the water department at Salem, Mass., for the fifth consecutive term.

A. F. McCallum, of Toronto, has been appointed city engineer of Hamilton, Can., succeeding E. G. Barrow, who is retained as consulting engineer.

A. A. Knudson, of New York City, has been retained by the water boards of Saginaw, Mich. to make an electrolytic survey of the water mains.

H. E. McLean has resigned as city engineer of Cloquet, Minn., to accept a position on the engineering corps of the Duluth, Rainy Lake & Winnipeg Railway.

Edmund P. Looker, former mayor of Boonton, N. J., for two terms, died at his home in that city March 6, of typhoid fever. Mr. Looker was 46 years of age.

Alexander Potter, M. Am. Soc. C. E., presented a paper on water softening and filtration plant before the Engineer's Club of Central Pennsylvania, at Harrisburg, March 2.

Ivan de Mitkiewicz, of the publicity department of the Western States Portland Cement Co., Independence, Kan., represented his company at the Chicago Cement Show.

Samuel H. Pitcher has resigned as assistant engineer in the office of the city engineer at Worcester, Mass., which office he has held for thirteen years, and has opened an office at 418 Main street, Worcester, for conducting a general consulting engineering practice.

John M. McMaster was elected mayor of Winnsboro, S. C., March 22. Other municipal officers elected were as follows: W. R. Rabb, member of board of public works;; aldermen, C. F. Elliott, J. M. Jennings, C. A. Robinson, J. D. Fulp, C. W. Madden, J. F. Davis.

George C. Diehl, of Buffalo, N. Y., county engineer of Erie county, has been appointed chairman of the national good roads board of the American Automobile Association.

Thomas Taylor Johnston, consulting engineer, Chicago, Ill., died in that city recently. Mr. Johnston was the designer of the water works systems of Savannah, Ga., and Memphis, Tenn.

D. C. Weller was unanimously re-elected city engineer at Waynesboro, Pa., by the city council, March 18. This will make the eleventh term that Mr. Weller will have served as city engineer.

W. D. Stephenson was unanimously elected mayor at Los Angeles, Cal., March 15, to succeed A. C. Harper, resigned. Mayor Stephenson will serve until March 26, the date set for the recall election.

Ralph Modjeski, consulting bridge engineer, of Chicago, and J. Waldo Smith, chief engineer of the board of water supply, New York City, have been elected members of the Institution of Civil Engineers.

E. A. Kemmler, until recently resident engineer in charge of the construction of the Columbus sewage disposal works, and L. C. F. Balz, former resident engineer on water works at Manila P. I., have formed a partnership under the name of Kemmler & Balz, for practice as consulting engineers on general and municipal work. The firm has established offices in the Board of Trade building, Columbus, Ohio.

The favorable decision regarding the 80-cent gas law for New York City releases William D. Marks, C. E., from his three years' engagement by the New York corporation counsel as the only engineer regularly employed by the city in the prosecution of the case, and he is now free to serve other muicipalities or corporations operating gas or electric plants, in both of which he has had many years of experience.

W. H. Ham, M. Am. Soc. C. E., has resigned as chief engineer of the General Fireproofing Company to take up the department of concrete engineering with the firm of Messrs. Hollis French and Allen Hubbard, consulting engineers, Albany building, Boston, Mass., specialists in hydraulic and power development work, heating, ventilating, electrical engineering and concrete structural design.

Henry Bausch, vice-president of the Bausch & Lomb Optical Company, Rochester, N. Y., died at Augusta, Ga., March 1, after a long and painful illness. In business life Mr. Bausch gave most of his attention to the scientific problems connected with the construction of lenses and other optical parts of scientific instruments, mostly microscopes, a work for which he was thoroughly trained. Mr. Bausch was about 50 years of age. The immense plant of Bausch & Lomb remained closed all day on the day of Mr. Bausch's funeral.

Alexander Potter, C. E., consulting and constructing engineer, 143 Liberty street, New York, delivered a very interesting and instructive address on "The Growth of the Sewage Disposal Idea in America; What Constitutes Proper Disposal," before the Board of Trade and the Commercial Club of Indianapolis, which was of special interest because the legislature of the State of Indiana has just passed a law regulating stream pollution, and the city of Indianapolis is likely to feel the first effects of the new law because of the serious nuisance which that city is creating by discharging its sewage unpurified into White river.

MACHINERY AND TRADE

The Atlas Railroad Asphalt Paving Plant.

The Atlas Dryer Company, of Cleveland, Ohio, write us as follows: A one-car Atlas railroad asphalt paving plant has three melting kettles, two open and one closed, with capacity of thirty tons; an Atlas dryer that will easily dry and heat to 350 degrees Fahrenheit twenty tons of sand per hour; a 35 h. p. engine, with 50 h. p. boiler; air pump, asphalt hoist, scales for weighing asphalt and for weighing sand. All asphalt pipings 4-inch and steam-jacketed. Everything is the best that money can buy. An Atlas dryer does not blow out any dust to create a nuisance.

The Portland Cement Industry from a Financial Standpoint.

Edwin C. Eckel, one of the best known experts on the cement industry of the United States, the author of "Cements, Limes and Plasters," the standard work on these materials, and, until recently, in charge of the cement work on the U. S. Geological Survey, has written a book entitled "The Portland Cement Industry from a Financial Standpoint," which ought to prove invaluable at once to the banker who is invited to aid in the flotation of cement securities and to the investor who is invited to buy them. As Mr. Eckel states in the preface, his book will have served its purpose if it aids either banker or investor to foolishly promoted propositions.

Mr. Eckel's book differs from any previous publication on the cement industry in that it devotes itself chiefly to the financial side of the subject. In fact, it is the first authoritaive presentation of the financial side of an important American industry. Matters of purely technical importance are for this reason subordinated to the questions of financial methods and profits. Such subjects as raw materials and manufacturing processes are discussed, therefore, only as they have a distinct bearing on financial results.

The opening chapters contain a brief discussion of the processes and raw materials on which cement manufacture is based, with very complete statistics covering the past history and production of Portland cement. The following chapters discuss the probable future trend of the cement industry in considerable detail, particular attention being paid to the price-history of the trade. Among the other subjects of financial interest taken up by the author are the general status of industrial bonds; the status of bonds issued for plant construction; the question of overcapitalization; the actual basis on which existing cement companies are capitalized; the methods of cement promotions; and the probable profits of the industry. The annual reports and dividend records of several leading American cement companies are tabulated and analyzed.

"The Portland Cement Industry from a Financial Standpoint" is attractively prepared in a typographical way and substantially bound. Published by Moody's Magazine, 35 Nassau street, New York, at $2, net.

Durable Culverts for Highways.

The season for road work is opening, and the culverts will need much attention. There are many which must be renewed, and it will be worth while to consider carefully the various forms which are on the market. The corrugated iron culvert has many claims of superiority, in cost, durability, ease of handling and installation, and the nestable forms, such as the Acme, have special claims as to the latter point and the saving of expense in transportation. The Canton Culvert Co. have issued a folder which gives full information about the Acme corrugated metal culverts, which they will send on request. Address them at Canton, O., and ask for Folder No. 103.

The Halden Calculex.

The improved Halden calculex is a circular slide-rule 2¾ inches in diameter and ¼ inch thick, which, with a square booklet of nearly the same size, goes into a little vest-pocket leather case, and so can be carried continually with great convenience. It is equivalent in accuracy to a 5-inch slide rule, and is more convenient and durable. Logarithms, squares, square roots, cubes, cube roots, angles, etc., may be read directly without moving the dials, by the aid of a guide line on the revolving glass face. The front face has five circular scales, logarithms, the two calculating scales, and the two square-root scales. The back face has six scales, the scale of angles, the two calculating scales for inverse proportions, and the three cube-root scales.

A little use of the instrument demonstrates its labor-saving qualifications, and it is well worth the $5 charged for it by Wm. Ainsworth & Sons, Denver, Colo., the well-known instrument makers of the West, who will send the instrument on approval.

The Andrews Pipe Plug.

R. C. McWane, the progressive cast-iron pipe man at 220 Broadway, New York, proposes to reduce the number of breakages of pipe bells in cutting out plugs, and so he is pushing the use of Andrews's pipe plug, which has a little pocket on one side into which to drive the chisel or pin and break out the plug without danger to the pipe bell. He will tell all about it on request.

Natural Cement is Durable.

The accompanying little photograph shows the Illinois Central bridge at La Salle, Ill., built in 1856, and famous for many years thereafter as the largest railroad bridge in the middle West, being three-fourths of a mile long and more than ninety feet high. The aqueduct, the towpath and the Illinois and Michigan canal, prominent in the view, are historic in that the crew of the General Thornton, with a cargo of sugar en route from New Orleans to Buffalo on the first trip made on the new waterway in April, 1843, held a celebration for a day on the site on which now stands the new city water works plant shown in the photograph adjoining the large smokestack. It is of interest to note that these old structures were laid with Utica natural hydraulic cement, made at Utica, only a few miles away, and that their condition is incontestable proof of the value of that cement as a permanent and strong building material.

The first coal found in the new world was found practically within the limits of this view, as the ends of the mine dumps show therein.

The Concrete Post.

The concrete post has come to stay, and, while there are hundreds of patents on posts, apparatus for and methods of making them, a few will probably govern the market from inherent quality and at the same time cheapness of product. The cheapness of the mold is of secondary consideration unless one is making posts only for his own use and not many of them.

The Champion machine is very simple, consisting of two end pieces, and two sides hinged at one end and locked and unlocked at the other. It can be operated by one man. The standard post comes from the mold with rounded corners, tapers from 5 by 5 inches at one end to 3 by 3 at the other, is 7 feet long and weighs 95 pounds, but can be varied in dimensions and weight very readily. The reinforcement may be plain, crimped, twisted or barbed wire, old fence wire, hoop iron, etc., one wire in each corner. No. 9 wire is very satisfactory.

The fasteners are preferably galvanized fence staples about 1¾ inches long, with ends slightly bent over. A fastener strip is laid on the finished post and the fasteners are placed in holes in the strip and pounded down into the concrete, which is kept in place by the strip. Pounding on the strip on each side of each staple compacts them firmly in place. When the post is cured the strip is removed, and is ready to use again for the same purpose. The post lends itself readily to other methods of fastening the fence on it.

The cost of a post is itemized in the booklets of the company, and is said to run from 14 to 18 cents each.

A booklet telling all about the machine and how to make posts in it will be sent on application by the Champion Post Machine Co., Mendon, Mich.

The Case Steam Road Roller.

The steam road roller of the J. I. Case Threshing Machine Co. is an up-to-date American machine, practical and capable of doing its work thoroughly and yet with dispatch, differing in this respect from the slow-moving machines built on European lines, and designed to travel only forward and back. The machine is to some extent a development of the Case traction engines, which have been on the market for many years.

The engine on the road roller is a single side-crank of the simplest type, and the slide valve a plain D of locomotive type. The fly-wheel and friction clutch form a complete, efficient and convenient device for transmitting the power of the engine to the gearing, and can be wholly disconnected therefrom when the engine is to run outside machinery by belt from the fly-wheel. The throttling governor allows a variation of speed of 100 to 300 revolutions per minute of the fly-wheel. The boiler is of locomotive type, and the feedwater heater is very simple in construction. The boiler is mounted on springs sufficient to absorb the engine vibrations.

The front roll is in four sections, 41 inches in diameter and 12½ inches face,

ILLINOIS RIVER AND CANAL AT LASALLE.

and is mounted with a ball-bearing pivot, giving uniformity in pressure on the sections of the roll and also uniformity in power required to steer. The roller may be turned completely around inside of a 24-foot circle. The rear rolls are 72 inches in diameter and 20-inch face. Both rear rolls drive all the time. They overlap the front roll track five inches, making the width of rolled area 7 feet 1 inch.

Scrapers are held to the wheels by adjustable spiral springs. They are low down, dropping the dirt into the hole from which it was taken. There are 16 holes in each rear roll rim to set spikes for picking up old surfaces.

The engine is convertible into a hauling engine by changing the front roll to a two-wheeled truck.

A 12-barrel steel tank wagon accompanies the roller, and can be made a sprinkling wagon if desired.

The J. I. Case Company have branches in many large cities and agents in every city where there is business to be developed. A card to the home office at Racine, Wis., will bring full information about their machines.

A New Drinking Fountain.

The accompanying photograph shows a new design for a drinking fountain, intended to take the place of the usual form of deep bowl fountains, which present a broad surface, easily broken if struck by the tongue of a heavy wagon. The three supports make the fountain much more stable and resistant of side pressure than the ordinary single slender support with a single tie rod down through its center. This fountain is made by the Superior Iron Works Company, Superior, Wis., who will send full information about this and other designs on request.

A DURABLE FOUNTAIN.

The New Indiana Paving Law.

The Thornton paving act, which by virtue of an emergency clause has been in effect ever since it was signed recently by Governor Marshall, of Indiana, carries with it no provision that negotiations for street improvements which may be in progress shall not be affected. There is a provision that four or more kinds of paving shall be specified upon which bids are to be received, and the property owners then choose which they shall have. The act carries provisions affecting the Barrett law, which make street improvement bonds gild-edged investments. Under the old law, if an installment became delinquent, the bondholder could only sue for the one payment. Now, when one installment becomes delinquent, this makes possible the sale of the property for the entire assessment. Another provision requires, in case of prepayment of the installments due, that the entire series of bonds shall be turned over by the bondholder. The result of this will be to deprive the county treasurer of interest on about $150,000 yearly, for, under a decision of the appellate court, he can not deposit prepaid Barrett law bonds, so he could hold them on his own account until the six months term of notice required by law expired. This operated in most cases to give the treasurer the use of the money for about one year. Under the new law the six months notice is not required, and the treasurer is ordered to surrender the bonds at the first semi-annual settlement day following prepayment. This also helps to make the bond gilt-edged.

The bill also provides that a contractor may have monthly estimates made of the progress of his work on any improvement. Such estimates are to be made by the engineer, and when approved by the Board of Works a certificate is issued to the contractor for 65 per cent. of the work completed during the month. The act says such certificates shall be negotiable. It was the purpose of this provision to put the financially weak contractor on an equal footing with his strong brother. It is pointed out, however, that when a work is completed, if property owners should find reason for withholding approval of the assessment roll, and therewith payment to the city, the banker who had discounted the certificates would be without recourse. The contractor in such an emergency, if he chose to do no more than the law required, could force the bank to stand such loss, while he made away with 65 per cent.

Proposed Paving Test in Spokane.

A novel method of making a comparative test of the various pavements now in general use is proposed by the board of public works of Spokane, Wash. The board addressed a letter to Warren Brothers Paving Co., of Portland; Pacific Creosoting Co., of Seattle; Rudolph S. Blome, of Seattle; Denny-Renton Co., Western Asphalt Co., Independent Asphalt Paving Co., Barber Asphalt Paving Co., and the Oileroid Paving Co., of Spokane. The board requests that all communications be written if the company wishes to take advantage of the proposition. The letter is as follows:

The city is about to enter upon an era of paving, and in the next five years it is expected a large amount of money will be expended for that purpose. A number of different pavements are being urged upon the city for use in the new work.

The board of public works desires to make a test of these different paving materials that will aid it in coming to a conclusion as to the most economical pavement and the most advantageous.

Havermale street, on the island, is about 700 feet long, and is advantageously situated for such a test. It has been suggested to the board that this street be divided into equal transverse sections, and that each company manufacturing paving put down, at its own expense, a section of pavement, to belong to the city when completed. If seven companies desire to compete, each would put down one-seventh of the street, or approximately 100 lineal feet, full width of the street.

Trade Publications.

Bulletin No. 20 of the Association of American Portland Cement Manufacturers is upon the subject of "Mixing and Placing Concrete by Hand."

"Prism" is "a little magazine concerning that world of wonder and beauty revealed by the lens" which is issued by the Bausch & Lomb Optical Co., Rochester, N. Y., and the February number Vol. ii, No. 9, is devoted to speed photography and the Tessar lens.

The Universal Portland Cement Co., Chicago and Pittsburg, issues a handsomely illustrated booklet of "Plans for Concrete Residences," containing a selected number of designs with descriptions and estimates of cost submitted in a competition of the Chicago Architectural Club for prizes offered by the company, and will send it to those interested on request.

The Carnegie Trust Co., 115 Broadway, New York, an institution beginning its third year with over 3,000 accounts and over $15,000,000 of resources, issues a booklet handsomely illustrated in colors, giving information about the company, its business and its offices and facilities.

The Bone System of retaining wall construction is fully set forth in detail in a booklet issued by the Concrete-Steel Retaining Wall Co., 1517-18 First National Bank Bldg., Cincinnati, O., which shows the reasons for the strength of the walls built on this system and for their low cost as compared with other retaining wall construction, which will be sent by the company to any address on request.

The monthly "Pipe Parley" of the McWane Pipe Works, 220 Broadway, New York, says that conditions as to price, stocks and facilities for manufacture of cast iron pipe are ripe for the revival of trade which will shortly come because of

the large amount of deferred business which cannot be held off longer.

Monthly bulletin No. 57 of the Universal Portland Cement Co. illustrates reinforced concrete factories in which Universal cement has been used, and the Chenoweth system of making concrete piles by rolling a wire mesh laid in a mass of concrete about a collapsible steel core, which is later withdrawn and the shell filled with concrete.

The Steel Protected Concrete Co., Real Estate building, Philadelphia, Pa., are distributing their advertisement printed in gold on a black standard wooden desk ruler with brass edges, also an aluminum paper-weight in the form of a sample section of the galvanized steel corner bar used in their concrete curb construction. Accompanying these souvenirs are an illustrated pamphlet showing the uses of the curb protection and one giving directions for laying it, all of which they will send to interested persons on request.

"Aid to Shippers" is the title of a 72-page book containing a quantity of information of value to all engaged in the export or import trade. The book is issued by Oelrichs & Co., of New York, for more than forty years the American representatives of the North German Lloyd Steamship Company, who, by reason of long experience, are qualified to advise. The table of foreign moneys with United States equivalents, together with weights, measurements, tariffs, customs requirements, etc., etc., will be found of great value. The book will be sent, postpaid, on request to Oelrichs & Co., Forwarding Department, 5 Greenwich street, New York.

The latest publication of the Indianapolis office of the Lehigh Portland Cement Co. is a booklet giving "A Few Ideas on Concrete Block Construction" in the shape of pictures of business, church and residence buildings and fences. F. E. Paulson, western traffic manager of the company, will send it on request. His address is the Traction Terminal building, Indianapolis, Ind.

The 1909 catalog of Keuffel & Esser Co., New York, is a cloth-bound volume of 543 pages, with full index. It includes all possible needs of the engineer, surveyor, architect, student, in the way of instruments, drawing materials, papers, cloth, photographic apparatus, field books, gauges, books, etc. Its completeness is indicated by the 23 entries in the index of scales, 22 under protractors, 47 under paper, etc.

The number of inquiries received asking for information about concrete steel pavements, and particularly the Blome concrete blocked pavements, is evidence of the widespread interest in this, one of the newest forms of pavement, and of the value of the publicity it has attained. Rudolph S. Blome Co., Unity building, Chicago, Ill., will send full information on request.

One of the series of handsome booklets issued by the Lawrence Cement Co., Harrison building, Philadelphia, and 1 Broadway, New York, describes the new Liberty street terminal of the Central Railroad of New Jersey, in the construction of which their cement was used.

Trade Notes.

BRICK.

Cleveland, O.—A new paving brick company has been incorporated, to be known as the Murray Brick Company. The work of building will begin at once, and it is hoped that the plant will be in operation by the first of July. Both building and paving brick will be manufactured.

CEMENT.

Johnson City, Tenn.—An option has been taken on a 50-acre tract of land, and a plant will probably be erected for the manufacture of cement. Judge N. A. Patterson, of Vineland, 5 mis. north of this city, may be able to give information.

Valparaiso, Chile—A company has been formed to manufacture cement at Calera, near here. A plant with a capacity for manufacturing 200,000 barrels of cement a year, or enough to supply the local demand.

Montgomery, Ala.—James S. Pinckard and Massey Wilson have purchased the plant and property of the Alabama Portland Cement Co., including 40 acres of cement land, located at Spocari, Ala. The company will be reorganized and will expend $200,000 for reconstruction, improvements and additional machinery to increase the daily capacity from 500 to 1,000 barrels. The contract for conducting the overhauling of machinery and engineering work in general was given to Cook & Laurie.

Oklahoma City, Okla.—About 15 prominent men of this city made a recent visit to the town of Reynolds to investigate with a view of erecting a Portland cement plant.

CONCRETE BLOCKS.

Johnson City, Tenn.—A cement block plant will be located in the southwest addition of this city by Henry R. Brown, of Greeneville.

Columbus, O.—The Columbus Concrete Construction Company has been incorporated by Boston Medbery, E. B. Taylor, H. B. Micher, R. T. Fusher and S. B. Wright.

Albany, Ore.—The Albany Trading and Cement Block Co. has been incorporated by W. H. Stover, John F. Morrison, W. D. McKinnon and Robert Ferguson.

Morris, Ill.—A. A. Braun has begun the manufacture of cement shingles.

Duluth, Minn.—The Modern Cement Products Co. is a new concern here.

Asbury Park, N. J.—The cement block plant of Low Brothers was destroyed by fire March 11.

Milwaukee, Wis.—The Concrete Steel Caisson Co. has been incorporated by Frank D. Fulton, Charles C. Russell and John W. B. Van Houten.

Oklahoma City, Okla.—The O. C. Green Concrete Machinery Co. has been incorporated by O. C. Green, T. F. Sunt and S. J. Carpenter.

Binghamton, N. Y.—The Crossett & Lloyd Concrete Co. has been incorporated by Frank L. Crossett, Walter O. Lloyd and Eugene W. Prout.

Perry, Ia.—J. C. Bryan and S. P. Bryan contemplate the incorporation of a com-

pany to manufacture cement brick, tile, blocks, posts, etc.

PURCHASE OF MACHINERY.

Danville, Va.—Special.—The J. T. Watson Brick Corporation, mfrs. of brick and drainage tile, are in the market for a plant for the manufacture of asphalt paving blocks—heater, mixer and press capacity of 10,000 to 15,000 per day.

Provo, Utah—Special.—C. H. Decker desires to purchase tools and machinery for an electric light plant and boulevards.

Keyser, W. Va.—Special.—The town of Keyser is in the market for dump carts.

Concordia, Kan.—Special.—J. C. Partch is in the market for a small mixer.

Greenfield, Mass.—Special.—The Clapp & Abercrombie Co., 90 Main st., is in the market for a precise level rod.

Richmond, Ky.—Special.—John A. Mershon advises us that he is in the market for machinery and tools for streets and paving.

Red Oak, Ia.—Special.—William Apple desires to purchase cement machinery.

Leon, Ia.—Special.—S. A. Gates, mayor, is in the market for road tools.

Antigo, Wis.—Special.—Herman Otto, box 405, desires to purchase a concrete mixer.

Boise, Ida.—Special.—William Keith, 1421 Grand ave., is in the market for concrete mixers and finishing tools.

St. Louis, Mo.—Special.—F. P. McCormick, vice-president Parker-Washington Co., says that company is in the market for a new or second-hand asphalt plant, with a capacity of 2,000 sq. yds. of 1½ to 2-in. top each 9 hrs. run.

Selma, Ala.—Special.—Chambers, McKeil & Co., architects and builders, would like to receive catalogues of all kinds for their reference shelves. The company also owns the Valley Creek concrete works.

Ardmore, Okla.—Special.—The Shelby-Downard Asphalt Co. desires names and addresses of manufacturers of brick presses which could be used to make asphalt blocks—meaning machines which would reduce hot asphalt paving mixture into blocks under heavy pressure.

Cheyenne, Wyo.—Special.—M. O'Keefe desires catalogues of cement mixers, tools, etc.

Parkersburg, W. Va.—Special.—John W. Curry advises us that he is in the market for a concrete mixer.

Auburn, Ind. — Special. — Chester C. Hodge desires to purchase a hoist for raising and lowering suction pipe of centrifugal pumps on barges. He also is in the market for wire hoisting rope and pulleys.

North Yakima, Wash.—Special.—The Felton-Wimer Concrete Co. is in the market for a portable stone crusher suitable for crushing coarse gravel and small boulders up to 5 ins. diameter.

Vinton, Ia.—Special.—Thomas Wood desires the addresses of parties having second-hand concrete mixers for sale.

Altoona, Pa.—Special.—P. J. Fagan & Co., 1105 15th st., advise us that they are in the market for a trench excavator and concrete mixer.

Malone, N. Y.—Special.—O. H. Vaughan advises us that he is in the market for sidewalk tools, a concrete mixer and a block machine.

Antigo, Wis.—Special.—P. J. Gilles, p. o. box 643, desires catalogues for tools.

Muskogee, Okla. — Special. — J. Alex. Handy, p. o. box 997, is in the market for a gravel pump and a concrete mixer (batch).

Maryville, Mo.—Special.—D. T. Surbaugh advises us that he may purchase a concrete mixer.

Santa Clara, Cal.—Special.—C. A. Fitzgerald, box 31, desires to investigate block machines.

Waupun, Wis.—Special.—W. S. Whiting, box 115, advises us that he is in the market for sidewalk tools.

Renovo, Pa.—Special.—T. E. Naylor advises us that he is in the market for dump wagon boxes, to fit over wagon, and for plain and ornamental block machinery.

Redding, Cal.—Special.—C. Stabler advises us that machinery and tools may be purchased for sewer and cement work.

Marshfield, Wis.—Special.—Louis Larsen advises us that he is in the market for cement tile.

San Francisco, Cal.—Special.—A. Raventos, 364 Pacific Bldg., is in the market for a hydraulic press.

PURCHASE OF MATERIALS.

Greenfield, Mass.—Special.—The Clapp & Abercrombie Co., 90 Main st., is in the market for cement and sewer pipe.

Richmond, Ky.—Special.—John A. Mershon advises us that he is in the market for materials for streets and paving.

Canandaigua, N. Y.—Special.—Z. T. Darrow & Son are in the market for 20 tons of deformed steel bars.

Red Oak, Ia.—Special.—William Apple desires to purchase cement and sand.

Leon, Ia.—Special.—S. A. Gates, mayor, desires to purchase cement and sewer tile.

Boise, Ida.—Special.—William Keith, 1421 Grand ave., is in the market for cement coloring.

Altoona, Pa.—Special.—P. J. Fagan & Co., 1105 15th st., desire to purchase sewer pipe and manhole castings.

Renovo, Pa.—Special.—T. E. Neylor advises us that he desires to purchase concrete reinforcing materials.

Waupun, Wis.—Special.—W. S. Whiting, box 115, advises us that he would like prices on car lots of cement.

Danville, Ill.—Special.—Walter E. Winn advises us that he is in the market for Portland cement.

Redding, Cal.—Special.—C. Stabler advises us that he may purchase sewer pipe, cement, etc.

LIGHT, HEAT AND POWER.

Rossville, Ind.—The Rossville Light and Heat Co. has been incorporated to furnish light and heat to this town, by J. E. Silverthorn, A. J. Chittick and S. R. Pence.

MISCELLANEOUS.

Indianapolis, Ind.—The Triad Engineering and Construction Co. has been incorporated, to do a constructing and engineering business, by Harry A. Butterfield, A. W. Malone and C. A. Burneth.

New York City.—Special.—W. P. Pressinger, who recently resigned as general manager of the Compressor Department of the Chicago Pneumatic Tool Co., advises us that he organized the W. P. Pressinger Co. to handle the vacuum cleaning machines, both portable and stationary, made by the Keller Manufacturing Co., of Philadelphia, Pa., and formerly sold by the Chicago Pneumatic Tool Co. The new company has opened offices and salesrooms at No. 1 E. 54th st., New York City, and will establish local agencies at all distributing points throughout the eastern territory.

PAVING.

Crawfordsville, Ind.—Dunn McClelland, chairman of the board of public improvements, accompanied by Councilmen Allen Johnson, W. C. Murphy and W. F. Robb and City Engineer Burl Johnson, visited

Indianapolis March 9 to investigate bitulithic paving. The citizens in Water st. have asked for this material, and it may also be used in the new Mills Place addition.

Patents Concerning Garbage and Refuse Collection and Disposal.

843,971. Refuse Burner. Clifton D. Stevens, Muskegon, Mich.
845,964. Garbace Receptacle. Chas. C. Mittendorf, St. Louis, Mo.
850,167. Refuse Can. Thos. Lee, Home City, O.
853,355. Garbage Wagon. Albert Gull, Swissvale, Pa.
856,264. Combined Ash and Garbage Receptacle. Joseph Kolouch, Milwaukee, Wis.
857,372. Evaporator and Extractor for Garbage Reduction. Frederick G. Wiselogel, Indianapolis, Ind.
858,561. Incinerating Furnace. David E. Bennett, Elmira, N. Y.
862,784. Garbage Receptacle. Howard E. Ames, U. S. Navy.
863,305. Night Soil Reduction Plant. Patrick E. McDonnell, Jr., Chicago, Ill.
865,427. System of Refuse Disposal. Arthur N. Pierson, Westfield, N. J.
867,683. Ash Can. Chas. J. Sussman, New York, N. Y.
867,941. Garbage Cremator. David E. Bennett, Nazareth, Pa.
868,820, 868,821, 868,894. Garbage Receptacle Container. Chas. H. Stephenson, Lynn, Mass.
868,895. Sheet Metal Receptacle (for Garbage). C. H. Stephenson, Lynn, Mass.
870,887. Garbage Receptacle. Torbett H. Johnson, Kansas City, Mo.
871,955. Garbage Receptacle. Adam Reed, Los Angeles, Cal.
872,466. Garbage Crematory. Isaac D. Smead, Cincinnati, O.
874,497. Device to Prevent Sea-Dumped Garbage from Being Thrown onto the Beach. Samuel E. Gladding, Jersey City, N. J.
887,219. Garbage Destructor. Geo. W. Parker, New York, N. Y.
889,418. Apparatus for Treating Night-Soil, etc. Earnest T. Welcome, Philadelphia, Pa.
890,818. Garbage Pail. Isaiah H. Taylor, Philadelphia, Pa.
892,942. Garbage Plant. Thos. W. Draine and Thos. F. Shingledecker, McKees Rocks, Pa.
893,229. Incinerator for Garbage, Excrement, etc. Emile F. Esperandieu, Buffalo, N. Y.
893,267. Garbage Receptacle. Henry L. Schellenberg, Detroit, Mich.
895,129. Garbage Incinerator. Wm. H. Van Doren, Los Angeles, Cal.

Patents Concerning Street Cleaning.

826,890. Street Flushing Apparatus. Christian E. Schafer, Cleveland, O.
845,100. Apparatus for Removing Snow From Streets. Emanuel G. Kohout, New York, N. Y.
847,199. Dirt Carrier. Joseph H. Moragne, Honolulu, Hawaii.
848,040. Street Sweeper. Arthur R. Monette, New York, N. Y.
848,571. Sweeper. Josiah B. Scovell, Duluth, Minn.
850,005. Street Sweeper. Velo Houle, Muskegon, and A. W. Konkle, Manistee, Mich.
853,171. Cement Sidewalk Cleaner. Frank V. Healy and John H. Fox, Sac City, Iowa.
857,178. Snow Shovel and Wagon. Mathias Kotraschek, New York, N. Y.
854,680. Street Flushing Apparatus. Chas. E. Wiberg, Ashland, Wis.
857,226. Scraper. Thos. Booth, Boise, Idaho.
857,415. Street Sweeping Machine. Georg Pum, Vienna, Austria-Hungary.
858,422. Apparatus for Cleaning and Improving the Surface of Roads. John E. Smales, Leatherhead, England.
858,602. Street Flushing Machine. Jas. L. Hopkins, St. Louis, Mo.
858,946. Street Sweeping Machine. Curtis Bly, Ticonderoga, N. Y.
859,487. Street Sweeping Machine. John E. Dailor, Rochester, N. Y.
862,224. Machine for Sweeping Gutters. Joseph Weiland, Rochester, N. Y.
865,311. Street Cleaner. Israel Ludlow, New York, N. Y.
866,452. Street Sweeper. Amanuel O. Ford, Indian Springs, Tex.
870,516. Road Scraper. Chas H. Lyons, Gila River Valley, N. M.
870,700. Street Flusher. Geo. H. Thebus, Belleville, Ill.
871,212. Street Sweeper. Wilfred Dupre, Worcester, Mass.
872,196. Street Sweeper. Frances M. Pittman, Logansport, Ind.
872,667. Road Scraper. Harrison Muchey and Eugene Robertson, Triplett, Mo.
873,569. Street Sweeping Machine. Chas. Malmquist, Sioux City, Iowa.
875,375. Street Sweeper. Fred'k. E. Penfold, Sydney, N. S. W., Australia.
876,727. Street Sweeper. Chas. K. Pevey, Worcester, Mass.
880,124. Street Cleaning Apparatus. Chas. H. Butler, Oakland, Cal.
880,392. Street Cleaning Machine. Otto Neukirch, Cincinnati, O.
881,323. Street Sweeper. John H. Long, New Philadelphia, O.
882,578. Street Sweeper, John Nelson, Chicago, Ill.
882,626. Street Flushing Apparatus. Daniel Connelly, Cleveland Heights, and Christian E. Schafer, Cleveland, O.
884,421. Street Sweeper. Matthew V. Ruff, Smyrna, Ga.
886,263. Street Cleaner. John W. Smith, Dayton, O.
886,430. Street Sweeper. Chas. O. Smith, St. Louis, Mo.
886,040. Street Sweeper. Elmer E. Hall, Pittsburg, Pa.
888,609. Road Drag and Harrow. Hamilton D. Guffey, Unionville, Mo.
889,797. Street Sweeper. Richard I. Madden, St. Louis, Mo.
889,822. Road Scraper. Chas. H. Snyder, Percival, Iowa.
892,260. Combined Street Sweeper and Cleaner. Henry A. Huber, Winnipeg, Man.

Patents Concerning Hydraulics.

838,564. Art of and Apparatus for the Prevention of the Accumulation of Frazil and Anchor Ice in or on Water Power Apparatus. John Murphy, Ottawa, Ont.
827,025. Device for Thawing Frosted Fire Hydrants, Water Mains, and Service Pipes from Mains to House Hydrants. Geo. T. Liddle, Muskegon, Mich.
840,110. Dam. Howard L. Coburn, Boston, Mass.
848,139. Device for Mending Pipes. Gottfried Stuppar, South Chicago, Ill.
848,696. Siphon. Wm. S. Shields, Chicago, Ill.
850,244. Means for Protecting River Banks. John A. Nabers, Vernon, Tex.

854,936. Coupling for Bell and Spigot Pipes. Solomon R. Dresser, Bradford, Pa.
857,313. Well Screen. Geo. W. Stancliff, El Campo, Tex.
868,092. System of Construction for Foundations, Dams, Sea Walls, and the Like. Francois Hennebique, Paris, France.
870,866. Method of Building Dams. Wm. L. Church, Newton, Mass.
870,930. Dam. Wm. L. Church, Newton, Mass.
870,934. Dam. Howard L. Coburn, Boston, Mass.
873,906. Automatic Water Supply System. Harry C. Sillett, Salt Lake City, Utah.

Patents Concerning Water and Sewage Purification.

800,107, 800,108. Filters. John W. Hill, Philadelphia, Pa.
800,187. Apparatus for Aerating Polluted Liquids. Wm. M. Venable, Cincinnati, O.
800,480. Machine for Grading Sand. Chas. W. Palmer, Philadelphia, Pa.
803,096. Filtering System. Frederick A. W. Davis, Indianapolis, Ind.
814,634. Water Purification System. John F. Wixford, St. Louis, Mo.
818,693. Filter. Llewellyn W. Jones, Sewickley, Pa.
12,488, reissue. Apparatus for Cleaning Filter Beds. Hiram W. Blaisdell, Los Angeles, Cal.
820,824. Treating Distillery Slop. Curt J. Roehr, Philadelphia, Pa.
825,637. Process of Purifying Water. Charles A. Brown, Lorain, O.
837,566. Filtration System. John H. Heinz, Marion, Ind.
839,926. Method of Effecting the Destruction of Pathogenic Organisms in Water or Other Liquids. Patrick G. Griffith, London, England.
840,104. Scraping Machine for Closed Filters. Hiram W. Blaisdell, Los Angeles, Cal.
842,696. Water Supply and Purification System. Geo. Pfeiffer, Jr., Brown Mills, N. J.
842,850. Distributing Machine for Closed Filters. Hiram W. Blaisdell, Los Angeles, Cal.
843,572. Water Softening Plant. Arthur B. Bellows, Pittsburg, Pa.
845,744, 845,745, 845,746. Machines for Cleansing Filter Beds. Hiram W. Blaisdell, Los Angeles, Cal.
847,103. Filtering Apparatus. Mathias N. Otto, Lancaster, Pa.
857,563, 857,564. Apparatus for Feeding Lime to Water. Frederick B. Leopold, Evanston, Ill., and Chas. A. Brown, Lorain, O.
865,993. Filtering Device. Chas. Brossman, Jr., Indianapolis, Ind.
866,094. Water Clarification. Emile Vial, Brussels, Belgium.
867,003. Manual Scraping Machine (for filters). Hiram W. Blaisdell, Los Angeles, Cal.
866,346. Filtration Plant. Harold D. Elfreth, Philadelphia, Pa.
869,001. Sanitary Apparatus (Septic Tank). G. A. Lucas, Levallois-Perret, France.
869,272. Treatment of Sewage Sludges. Francis M. and Howard Spence, Manchester, and Reinhold Ockel, Lower Walton, England.
873,010. Machine for Cleaning Filter Beds. H. W. Blaisdell, Los Angeles, Cal.
874,542. Apparatus for Liquefaction and Purification of Sewage. Cornelius W. Russell, Burlington, Ia.
877,569. Apparatus for Treating Sewage. Arthur I. Joseph, Sydney, N. S. W.
880,540. Apparatus for Sewage Disposal. John H. Kinealy, Ferguson, Mo.
886,068. Apparatus for the Chemical Treatment of Water. Alexander Potter, New York City.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

CONTEMPLATED WORK.

Clinton, Ia.—Repaving is proposed for Fifth ave.

Eveleth, Minn.—Paving is proposed for Grant ave.

Eldora, Ia.—Paving is contemplated for Main st.

Boone, Ia.—Paving is contemplated in several streets.

Dallas, Ore.—This city contemplates about 20 blocks of paving.

Richland Center, Wis.—Paving is contemplated for Hazeltine st.

Florence, Neb.—Paving is proposed for the main street of this town.

Albia, Ia.—Paving and curbing is contemplated for Benton ave.

Des Moines, Ia.—Paving is contemplated for E. Court st. this spring.

McMinnville, Ore.—Bids are desired for paving about 20 blocks of streets.

Davenport, Ia.—About 8 mis. of paving will be constructed this summer.

Ellensburg, Wash.—Paving is contemplated for 6 streets this summer.

Centralia, Wash.—Paving is contemplated for about 17 blocks of streets.

Cresco, Ia.—The city council has decided to pave the main street of this city.

Coffeeville, Miss.—This city contemplates the construction of concrete walks.

Grand Island, Neb.—About 3 mis. of paving will be constructed this spring.

Bellingham, Wash.—Brick paving is contemplated for about 4 blocks of Railroad ave.

Walla Walla, Wash.—Plans are under consideration for paving about 40 blocks of streets.

Perry, Ia.—The city council has authorized the construction of a number of sidewalks.

Mexico, Mo.—This city contemplates constructing 1½ mis. of brick paving. E. D. Graham, mayor.

Warrensburg, Mo.—This city will construct about 6 blocks of brick paving. S. P. Tyler, cy. clk.

Seattle, Wash.—Ordinances have been passed providing for asphalt paving in Vine and Roy sts.

Kokomo, Ind.—Brick paving is proposed for E. Mulberry st. J. A. Burkhalter, pres. B. P. W.

Sheboygan, Wis.—A petition has been present to council asking for asphalt paving for N. 6th st.

Petersburg, Ind.—Plans are being prepared for constructing 22 mis. of gravel and macadamized roads.

Sioux City, Ia.—The construction of about 26 blocks of brick block paving is contemplated for this year.

Chattanooga, Tenn.—A resolution has been passed providing for the completion of the paving of Rossville ave.

Ishpeming, Mich.—The question of expending $20,000 per annum on the county road system will be voted on April 5.

Faribault, Minn.—The question of constructing asphalt, tar macadam and creosoted block paving is under consideration.

Rochelle, Ill.—This city will construct about 14 blocks of brick paving early this spring. W. B. McHenry, mayor.

Lexington, Ky.—The board of public works has decided to repave S. Broadway with vitrified brick. P. P. O'Neill, cy. engr.

Connersville, Ind.—The construction of 5 mis. of macadam road from this city to Glenwood is contemplated. K. L. Hanson, engr.

Sidney, O.—This city contemplates the construction of about 20,000 sq. yds. of brick paving this summer. W. R. Blake, cy. engr.

Burlington, Ia.—Paving is proposed for South, Vine and S. 8th sts. Macadam and brick block paving is contemplated for various streets.

Spokane, Wash.—An ordinance has been passed re-establishing the grade of E. Olive ave. Oileroid paving is contemplated for Newark ave.

Keokuk, Ia.—Vitrified brick paving is contemplated for Bank, 3d and 14th sts., and bids will be received in April. W. E. Strimbach, mayor.

Stevens Point, Wis.—A petition has been presented to council asking that N. 2d st. be macadamized. Bids will also be asked for rock for street work.

Sandusky, O.—Bids will be asked about May 17 for about 7,000 sq. yds. of paving in Jackson st. and 21,000 sq. yds. in Decatur and Adams sts. Clifford M. King, cy. engr.

Morocco, Ind.—Surveys have been completed for 11½ mis. of stone roads in McClelland and Colfax twsps. The viewers' report will be filed April 5. W. H. Parker, engr.

Madison, Wis.—Plans are being prepared an dbids will be asked about May 1 for street improvements, including 3 mis. of macadam, combination curb and gutter. J. C. Schubert, mayor.

Union City, Ind.—About 30,000 sq. yds. of vitrified brick paving on concrete base, with cement curb and gutter, manholes and catch basins, is contemplated. George L. Gregory, clk.

Shelbyville, Ind.—The city council contemplates the improvement of Elizabeth, John, Walker, Pennsylvania, Hamilton, Vine, Elliott, Conroy, Gordon and McKenzie sts. B. F. Swan, mayor.

Salina, Kan.—Special.—P. G. Wakenhut, cy. engr., says paving is contemplated as follows: Santa Fe ave., 4,600 ft.; East Iron ave., 2,000 ft.; S. 8th st., 4,400 ft.; W. Walnut st., 950 ft.

New Orleans, La.—Plans and specifications are being prepared for paving Carrollton ave., involving 118,000 sq. yds. of pitch asphalt on 6-in. concrete base with naphtha coat in lieu of bonder. W. J. Hardee, cy. engr.

Hillsboro, Tex.—City council has ordered an election to be held April 6 to vote on the issue of serial 40-yr. bonds to the amount of $26,000 for public improvements, including street improvements, sewerage and water works extensions.

Bloomington, Ill.—An ordinance has been passed providing for the paving of E. Grove st. at a cost of $9,228.11. The park board has decided to comply with the original plan of constructing concrete sidewalks in Franklin Park.

Albert Lea, Minn.—Special.—Wm. Barneck, cy. engr., says plans and specifications for paving Broadway with creosoted wood blocks or brick would be presented to council March 22. The work involves 9,236 sq. yds. of paving and 1,048 lin. ft. of stone curbing.

Newark, N. J.—An ordinance has been passed providing for granite block paving in Maine and Chestnut sts. and brick paving in Jeliff ave. Estimates will be prepared for straightening Clay st. and Carlisle pl. between Broad st. and the Passaic river. A petition has been received asking that S. 16th st. be paved with bitulithic.

WORK

Fayetteville, N. C.—This city will pave the cross streets of the business section with stone.

Hartford, Conn.—The common council has authorized the macadamizing of Pliny st. and Prospect ave.

Evansville, Ind.—Bids will be called for soon for constructing a 15-ft. concrete boulevard in Sunset Park.

Indianapolis, Ind.—Plans are being prepared for street improvements to cost about $55,000. B. H. Miller, cy. engr.

Everett, Mass.—This city has appropriated $20,000 for permanent pavements and $8,000 for sidewalks. Chris Harrison, cy. engr.

Dallas, Tex.—The municipal commissioners have decided to pave East Elm and Harwood sts. with bitulithic. J. M. Preston, cy. engr.

Springfield, Ill.—An ordinance has been passed for paving Illinois st., from Lawrence ave. to Washington Park, with asphalt with curbs and gutters.

Waterloo, Ia.—Objections will be heard April 15 on the resolution to pave 28 blocks of streets on the east side of the river. The streets embrace Almond, Argyle, Saxon, Dane, 7th, 9th, 11th and Sycamore.

Seattle, Wash.—Estimates of the cost of improving the streets have been submitted, and are as follows: Asphalt, Vine and other streets, $67,500; planking Occidental ave. and other streets, $4,400; asphalt, Roy and other streets, $5,500; grading and curbing 30th ave. South and other streets, $15,500; Ravenna boulevard and other streets, $11,600; Calhoun and other streets, $58,600; concrete walks in Valley and other streets, $12,300; grading and curbing 32d ave. N. E. and other streets, $20,000.

CONTRACTS TO BE LET.

Jamestown, N. D.—Bids are asked until April 5 for constructing sidewalks. G. E. Lyman, cy. audt.

South Bend, Wash.—Bids are asked until April 5 for improving the 8-miles post road. Co. engr.

Tomah, Wis.—Bids are asked until April

16 for constructing brick pavements. Comr. pub. wks.

Salem, Ind.—Bids are asked until April 5 for constructing a road. Sam G. Ellis, co. audt.

Seattle, Wash.—Bids are asked until April 6 for constructing the G. Erickson road. Co. cmrs.

Ashland, Ore.—Bids are asked until April 6 for 27,892 sq. yds. of hard surface pavement. Cy. recr.

Devils Lake, N. D.—Bids are asked until April 5 for constructing sidewalks. Ale Skratassi, cy. audt.

Ellendale, N. D.—Bids are asked until April 5 for constructing cement sidewalks. John King, cy. audt.

Wabash, Ind.—Bids are asked until April 6 for constructing 2 public highways. J. P. Noftzger, co. audt.

Sullivan, Ind.—Bids are asked until April 6 for constructing 2 county roads. Ben C. Crowder, co. audt.

Valparaiso, Ind.—Bids are asked until April 6 for constructing gravel roads. S. P. Corboy, co. audt.

Washington, Ind.—Bids are asked until April 6 for constructing a gravel road. Thos. Nugent, co. audt.

Berea, O.—Bids are asked until April 5 for grading, paving and curbing Beech st. O. R. Stone, clk. coun.

Fowler, Ind.—Bids are asked until April 6 for constructing 5 gravel and stone roads. Lemuel Shipman, co. audt.

Muncie, Ind.—Bids are asked until April 7 for improving 2 highways in Delaware twp. Joseph E. Davis, co. audt.

Cincinnati, O.—Bids are asked until April 2 for improving Princeton pike. Stanley Struble, prest. co. comrs.

Washington, Ind.—Bids are asked until April 6 for constructing the Albright gravel road. Thos. Nugent, co. audt.

Columbus, Ind.—Bids are asked until April 5 for constructing a gravel road in Flatrock twp. John M. Davis, co. audt.

Greenfield, Ind.—Bids are asked until April 5 for improving a highway in Buck Creek twp. Chas. H. Troy, co. audt.

Decatur, Ind.—Bids are asked until April 5 for constructing a macadam road in Root twp. H. S. Michaud, co. audt.

Kokomo, Ind.—Bids are asked until April 7 for constructing a gravel road in Clay twp. A. B. Esterling, co. audt.

St. Paul, Minn.—Bids are asked until April 5 for improving Bald Eagle Lake ave. with macadam. Edw. G. Kramer, co. audt.

Delphi, Ind.—Bids are asked until April 5 for grading, graveling and macadamizing certain highways. M. G. Haun, co. audt.

Harrisonburg, La.—Bids are asked until April 5 for constructing 4½ mis. of road near Trinity. J. A. Guss, Jonesville.

Graham, N. C.—Bids are asked until April 5 for constructing 45 mis. of macadams roads. D. A. White, secy. co. road comn.

Vincennes, Ind.—Bids are asked until April 6 for constructing 6,000 ft. of gravel road in Vigo twp. John T. Scott, co. audt.

Wauseon, O.—Bids are asked until April 5 for constructing stone or gravel roads Nos. 54, 58, 59 and 64. J. E. Merrill, co. audt.

Olympia, Wash.—Bids are asked until April 5 for paving Washington, Franklin, Adams, 5th and 6th sts. J. R. Dever, cy. clk.

Cleveland, O.—Bids are asked until April 10 fo rgrading, draining and improving North Woodland road. Wm. F. Black, co. clk.

Winamac, Ind.—Bids are asked until April 6 for improving the highways in Franklin and Tippecanoe twps. Ellis S. Rees, co. audt.

Rushville, Ind.—Bids are asked until April 6 for constructing gravel and macadam roads. Jesse W. Stone, co. aud.

Struthers, O.—Bids are asked until April 6 for constructing sidewalks, gutters and intersections during 1909. L. S. Creed, vil. clk.

Cando, N. D.—Bids are asked until April 5 for constructing cement and tile sidewalks and street crossings. H. D. Skinner, cy. audt.

Bowling Green, O.—Bids are asked until April 5 for grading and macadamizing 2 roads, 6¼ and 8 1-3 mis., respectively. F. W. Toan, co. audt.

Little Falls, N. Y.—Bids are asked until April 2 for 6,400 sq. yds. of paving in 2 streets, using any hard material. Dennis B. Reardon, clk. B. P. W.

Des Moines, Ia.—Bids are asked until April 5 for constructing and reconstructing cement and brick sidewalks and driveways. George E. Poorman, cy. clk.

Lafayette, Ala.—Bids are asked until April 5 for grading preliminary to building a road from the city to Lancett. A. J. Driver, Jr., probate judge.

Jackson, Minn.—Bids are asked until 1 A. M., April 2, for constructing 8,690 ft. of cement sidewalk, 486 ft. of steps and 920 ft. of curb. P. D. McKellar, co. audt.

Ingram, Pa.—Bids are asker until April 5 for grading, curbing and paving Prospect ave. and grading Staley st. J. S. Murray, borough engr., 9 Prospect ave.

Noblesville, Ind.—Bids are asked until April 9 for constructing 2 gravel roads on the line dividing Hamilton and Marion counties. N. W. Cowgill, audt. Hamilton co.; Albert Sahm, audt. Marion co.

Lake Mille, Wis.—Bids are asked until about April 20 for constructing about 23,000 sq. yds. of tar or asphalt macadam and about 6,000 lin. ft. of curb and gutter.

Bluffton, Ind.—Bids are asked until April 8 for constructing a gravel road in Liberty and Union twps. and stone roads in Lancaster, Jefferson and Nottingham twps. O. D. Garrett, co. audt.

Independence, Kan.—Bids are asked until April 7 for 42,000 sq. yds. of brick paving; 18,550 lin. ft. concrete curb and gutter; 9,500 cu. yds. of earth and 550 cu. yds. of rock excavation. J. D. Kramer, cy. clk.

Frederick, Md.—Bids are asked until April 5 for constructing 10,360 sq. yds. of vitrified brick paving on concrete base; 5,060 lin. ft. granite curbing; resetting 360 lin. ft. of old granite curbing. Mayor and bd. of aldermen.

Bay City, Mich.—Bids are asked until April 15 for constructing cement sidewalks in several streets and for paving several streets. L. U. Grant, cy. clk.

Shamokin, Pa.—Bids are asked until April 14 for vitrified brick paving and curbing in 8 streets, paving 6th st. with Trinidad asphalt, and repairing and sheeting Shamokin st. with asphaltum. W. H. R. Smink, ch. burgess.

Lyndhurst, N. J.—Sealed bids are asked until 8:30 P. M., April 5, for furnishing 750 tons of 2-in., 1½-in. and ¾-in. trap rock and dust. Bids will also be received at the same time for grading Page ave. John F. Wood, clk. Union twp.

Fulton, N. Y.—Bids are asked until April 19 for 32,000 sq. yds. of trap rock pavement; 7,750 sq. yds. vitrified brick paving and cross walks; 18,600 lin. ft. cement curb; 4,800 lin. ft. 10 to 22-in. storm sewer. W. A. Harrison, cy. clk.

Terre Haute, Ind.—Bids are asked until May 1 fo· constructing 125,432 sq. yds. of vitrified brick paving and 78,000 lin. ft. of

concrete curb and gutter in Sycamore, Spruce, Poplar, Crawford and other streets and avenues. P. B. Walsh, chmn. B. P. W.

Napoleon, O.—Bids are asked until April 9 for constructing 8 road improvements. F. J. Beck, co. audt.

Fargo, N. D.—Bids are asked until April 5 for constructing sidewalks during the year. N. C. Morgan, cy. audt.

Appleton, Wis.—Bids are asked until April 5 for constructing reinforced concrete sidewalks. E. L. Williams, cy. clk.

East Cleveland, O.—Bids are asked until April 6 for brick and asphalt paving, curbing, draining, etc. Kline Fleet, vil. clk.

Audubon, N. J.—Bids are asked until April 12 for constructing concrete sidewalks in a number of streets. E. W. Cobb, boro clk.

Decatur, Ala.—Bids are asked until April 12 for constructing 27½ mis. of macadam roads. Bullen & Boyd, care co. comrs.

Atlantic City, N. J.—Bids are asked until April 7 for grading and graveling Northfield and English Creek roads. E. D. Rightmire, co. engr.

River Forest, Ill.—Bids are asked until April 5 for asphalt and macadam paving, cement curb and gutter, etc. F. B. Klock, prest. bd. local impvts.

Lawrence, Kan.—Bids are asked until April 5 for constructing 7,775 sq. yds. of brick paving, 4,393 ft. of curbing, and 3,900 cu. yds. of excavation. F. D. Brooks, cy. clk.

Paola, Kan.—Bids are asked until April 6 for constructing 7,100 sq. yds. of concrete block paving; 8,000 sq. yds. of brick paving; curbing, etc. E. D. McLaughlin, cy. clk.

Des Moines, Ia.—Bids are asked until April 3 for paving W. 13th st. with asphalt, and until April 5 for constructing and reconstructing cement and brick sidewalks and driveways. Geo. E. Poorman, cy. clk.

Fulton, N. Y.—Bids are asked until April 19 for 32,000 sq. yds. of trap rock macadam paving; 7,750 sq. yds. vitrified brick paving; 18,600 ft. cement curbing; 4,800 ft. 10 to 20-in. sewer. W. A. Harrison, cy. clk.

Frederick, Md.—Bids are asked until April 5 for constructing 10,360 sq. yds. of vitrified brick on concrete; 5,060 lin. ft. new granite curb; resetting old curb; 2,880 ft. of sewer pipe. George Ed Smith, mayor.

CONTRACTS AWARDED.

Okron, O.—The contract for paving Orleans and Mayfield aves. was awarded to Dan O'Marr, for $8,054.

Muncie, Ind.—Harry J. McClellan was awarded the contract for constructing a highway in this county.

Dallas, Tex.—The Texas Bitulithic Co. submitted a bid, March 5, of $2.30 a sq. yd. for paving Ervay st.

Decatur, Ind.—The contract for constructing a macadam road has been awarded to Michael Miller, of this city.

Wabash, Ind.—The contract for constructing 1½ mi. of gravel road was awarded to John Smallwood, for $3,830.

Decatur, Ind.—The contract for constructing a macadam road has been awarded to Rufus Meshberger, of Berne, Ind.

Liberty, Ind.—The contract for constructing a gravel road was awarded to B. E. Dunn, of Frankfort, for $11,285.

Syracuse, N. Y.—The contract for repairing 18,000 sq. yds. of asphalt was awarded to John Young, for $21,325.

Louisville, Ky.—Staebler & McFarland secured the contract for constructing sidewalks, for about $20,000.

Brownstown, Ind.—The contract for building a gravel road has been awarded to James DeGoyler, of Seymour, for $4,900.

Greenfield, Ind.—The contract for building 2 highways was awarded to Boucher & Trittipp, of McCordsville, for $6,868.

Bloomfield, Ind.—The contract for constructing a gravel road was awarded to Samuel E. Dixon, of Elliston, for $3,366.

Sacramento, Cal.—The contract for macadamizing Auburn road was awarded to F. E. Frey, of San Francisco, for $72,-301.

Williamsport, Ind.—The contract for constructing 3 gravel roads was awarded to Holt & Milroy, of Frankfort, for $15,-145.

Washington, Ind.—The contract for constructing 4 gravel roads was awarded to Oscar Perkins, of Odon, Ind., for $15,-856.30.

Cumberland, Md.—The contract for grading and paving N. Bee st. was awarded to Thos. S. Kean, 8 Smallwood st., for $4,637.

Vernon, Ind.—Chas. G. Beaty & Co., of Saydon, was awarded a contract for constructing a gravel road 2½ mis. in length.

Vevay, Ind.—The contract for constructing a gravel road was awarded to Albert Beckman, Jr., of Rising Sun, Ind., for $8,070.

Rochester, N. Y.—The contract for paving N. Goodman st. was awarded to the F. V. Brotsch Co., 826 Clinton ave., for $39,-258.

Crown Point, Ind.—Betts & Irwin, of Frankfort, secured the contract for constructing a gravel road in this county, for $8,449.

Waukesha, Wis.—The Marquette Construction Co., of Chicago, was awarded the contract for macadamizing 7 streets, for $32,203.

Elizabeth, N. J.—The contract for paving Locust st. was awarded March 3 to Maynard & Flynn, of South Side, Pittsburg, for $10,501.

Oxford, Miss.—The contract for constructing concrete sidewalks was awarded to S. P. Ligon & Co., of Dublin, Ga., for about $25,000.

Indianapolis, Ind.—The contract for constructing a stone road in Marion co. was awarded to Moddlin Bros., of Marion, Ind., for $10,247.

Kentland, Ind.—The contract for constructing a system of macadam and stone roads was awarded to Henry E. Stoner, of this city, for $14,377.

Indiana Harbor, Ind.—The contract for constructing 218,000 ft. of sidewalks was awarded to W. W. Hatch & Sons, of Goshen, Ind., for $22,000.

Charlotte, N. C.—The contract for paving East ave. with bitulithic was awarded to the Atlantic Bitulithic Co., of Richmond, Va., for $30,000.

Greenwood, S. C.—The contract for paving the public square with vitrified brick was awarded to Bowe & Page, of Augusta, Ga., for $45,170.28.

Chicago, Ill.—M. H. McGovern & Co. secured contracts for paving 3 streets with asphalt, recently, at $1.90, $1.94 and $1.99 a sq. yd., respectively.

Corning, N. Y.—The contract for constructing 4,300 sq. yds. of brick paving was awarded March 4 to McGreevey, McGuigan & Baum Co., of Elmira, for $13,-380.

Washington, Ind.—The contract for improving Van Trees st. with combined curb and gutter has been awarded to the Sullivan Cement Stone Co., for $7,198.48.

Memphis, Tenn.—The contract for asphalt paving around Forrest Park and on Manassas st. was awarded to the Mineral Rubber Paving Co., for about $10,000.

Wabash, Ind.—Contracts for improving public highways have been awarded as

follows: John Smallwood, of Wabash, $3,830; W. W. Landess, of Banquo, Ind., $5,125.

Tacoma, Wash.—The Keasel Construction Co. was awarded the contract for paving an alley for $8,726. The contract for grading in district No. 636 was awarded to Jos. Wells, for $14,472.

Peoria, Ill.—The contract for resurfacing Knoxville ave. with brick was awarded to J. S. Allen & Co., for $9,504. John McAllister was awarded the contract for paving Globe st. for $1,404.45.

Spencer, Ind.—Contracts for constructing pike roads in this county have been awarded to Geo. R. Babbis, of Spencer; W. T. Smiley, of Bloomington, Ind.; O. P. Turley, of Orleans, Ind.

Spencer, Ind.—Contracts for constructing gravel and macadamized roads have been awarded as follows: Thos. Crouse, of Coal City, Ind., $7,794; S. D. Hickman, of Freedom, Ind., $4,220.

Vincennes, Ind.—Contracts for constructing gravel roads have been awarded as follows: 6,010 ft., John E. Delisle, Vincennes; 5,310 ft., Lewis Phillipe, Bicknell; 11,915 ft., H. F. Jones, Vincennes.

Elkton, Md.—The contract for constructing a stone road about 2 mis. in length was awarded to the Cecil Construction Co. for $17,841. This company also received the contract for constructing a stone road for $13,446.

Bloomfield, Ind.—Contracts for constructing gravel roads have ben awarded as follows: Wright and Stockton twps., Thos. E. Slinkard, of Lyons, Ind.; Smith twp., Jas. E. Jean, of Worthington. The contracts aggregate $24,244.42.

Franklin, La.—The contract for curbing and paving the main street of this town was awarded to Gaily & Clark, of Alexandria. The contract involves 28,500 sq. ft. of cement sidewalks and 5,200 lin. ft. of brick curbing.

Huntsville, Ala.—The Mineral Rubber Paving Co., of Memphis, Tenn., was awarded a contract for paving Franklin st. with asphalt, as follows: $1.82 per sq. yd. for asphalt, $2 per yd. for brick gutters and 52½ cts. per ft. for curbing.

Jersey City, N. J.—The contract for improving Mallory ave. was awarded to Van Keuren & Sons, of Jersey City, at 74.9 per cent. of the standard cost of labor and material. Henry Byrne secured the contract for Rose ave. at 85 per cent. of the standard cost.

Asbury Park, N. J.—The contract for paving Springwood ave. with brick was awarded to B. F. Sweeten & Son, of Camden, N. J., at $2.29 a sq. yd. for 13,500 sq. yds. of Glen-Gery brick on concrete, and 2,850 lin. ft. of curb reset, at 54 cts.

Boston, Mass.—The contract for treating 400,000 sq. yds. of macadam roadways in Jamaica Plain and Dorchester for 7 months from March 1, 1909, for the suppression of dust and the preservation of macadam road surfaces with calcium chloride was awarded to the Calcide Process Co., 402 Sears Bldg., at 4 cts. per sq. yd.

Baltimore, Md.—The contract for paving Fairmount ave. with vitrified brick was awarded to P. Reddington's Sons, 321 St. Paul st. The contract for paving the mall in Patterson Park and for constructing paths in Druid Hill Park was awarded to J. A. Kinlein & Co. The Hudson Cement and Supply Co. was awarded the contract for supplying bricks for the mall at $16.50 per M.

Noblesville, Ind.—Contracts for constructing and improving county roads were awarded March 18 as follows: Albert Fox, Noblesville, 6 roads, $28,744; Holloran & Haverstick, Noblesville, $8,574; J. B. Little, Indianapolis, $6,410; Clarance Barker, Noblesville, $3,995; Evan Bray, Noblesville, $1,112. The commissioners received bids from 137 contractors on this system of roads, which included the improvement of 10 roads.

Detroit, Mich.—Contracts for wood block paving on concrete have been awarded as follows: Alexandrine st., Julius Porath, $3,323, or $1.83 per sq. yd.; Beaufait st., Ferd. Porath & Son, $11,244, or $1.80 per yd.; Harper st., Julius Porath, $10,619, or $1.75 per yd.; Marantette st., J. A. Mercier, $8,898, or $1.96 per yd.; Sheridan st., Thomas E. Currie, $18,592, or $1.83 yer yd.

St. Louis, Mo.—Contracts were awarded March 12 as follows: G. Eyermann & Bro., 1216 S. Grand ave.—Virginia ave., $5,672; Daggett st., $14,181; Cadet st., $4,334; Ohio st., $6,389; Michigan st., $12,285; Minnesota st., $10,798; Hartford st., $4,158; Dunnica st., $4,369; Alberta st., $7,560. James T. McMahon—Knapp st., $6,303. Gilsonite Constr. Co.—N. Market st., $6,354. Skrainker Constr. Co., 319 N. 4th st.—Sacramento st., $6,917, and Leduc st., $12, 320.

Kansas City, Mo.—Paving contracts were awarded March 12 as follows: To Parker Washington Co. for asphalt on 7th, 25th and 7 other streets, $1.70 to $1.80 per sq. yd., and to the Cleveland Trinidad Paving Co. for paving 27th st. with asphalt, $2.12 per sq. yd.; to M. Mense for paving Main st. from 12th to 13th st. with sandstone block, $3.10, and 2 alleys with concrete pavement at 73 cts. and 90 cts. per sq. yd.; to J. E. Welsh for paving with brick 14th st. and 4 other streets, $1.49 to $1.64 per sq. yd., and to Wm. Harte for paving alleys with brick at $1.68 and $1.74, and with concrete at 73 cts. and $1.10 per sq. yd.

Kansas City, Mo.—Contracts for paving were awarded March 5 as follows: To McTernan & Halpin Constr. Co., for macadam pavement on Holmes, Charlotte, 23d and 39th sts. and Tracy ave., 90 cts. to $1.19 per sq. yd.; to the Halpin-Dwyer Constr. Co., for macadamizing Lydia ave., 29th to 30th st., at 95 cts. per sq. yd.; to J. E. Welsh, for paving 10th st. with sandstone block, $2,89; to Parker-Washington Co., for paving Wyoming st. with sandstone block, $3,59 per sq. yd., and Pitt ave. with asphalt, at $1.97; and to the Cleveland Trinidad Paving Co., for paving Jackson ave. with asphalt, at $1.82.

Seattle, Wash.—The Barber Asphalt Paving Co., White Bldg., was awarded the contract for paving Minor ave. N., as follows: Fixed estimate, $5,000; clearing and grubbing, lump sum, $9,000; 37,200 cu. yds. earthwork, 15 cts.; 1,254 lin. fet. 8-in. sewer pipe, $1.10; 8 catch basins, single inlets, each $60; 3 3½-ft. manholes, each, $55; 4 4½-ft. manholes, each, $60; 2,600 lin. ft. 6-in. pipe sewer, side connections, 75 cts.; 1,420 lin. ft. curved granite curbing, $1.66; 26,300 lin. ft. straight concrete curb, 30 cts.; 6,293 sq. yds. concrete sidewalks, $1; 46,164 sq. yds. asphalt paving, $1.70; 3,808 sq. yds. sandstone paving, $3.20; 3,734 sq. yds. brick gutters, $2,50; 50 sq. yds. concrete alley crossings, $1.35; 194 sq. yds. brick alley crossings, $2.50; 1,000 lin. ft. 3-in. pipe sewer, 20 cts.; 4,200 lbs. special castings, 6 cts., etc. Total cost, $138,381.

SEWERS.

Plainfield, N. J.—The proposed construction of a trunk sewer system for towns in this vicinity has been declared impracticable. The cost of the system seemed pro-

hibitive, and further consideration of it will be abandoned.

CONTEMPLATED WORK.

Audubon, Pa.—A sewage disposal plant is contemplated.

West Duluth, Minn.—A sewer in Raleigh st. is contemplated.

Charles City, Ia.—The construction of sewers is contemplated.

Traer, Ia.—The construction of a sewerage system is contemplated.

Uvalde, Tex.—The construction of a sewerage system is contemplated.

Auburn, Neb.—Voted to issue bonds for establishing a sewerage system.

Hastings, Neb.—The construction of about 1 mi. of new sewers is contemplated.

Kent, Wash.—The establishment of a sewerage system is contemplated here.

Nowata, Okla.—Plans are being prepared for constructing a sewerage system.

Waurika, Okla.—Voted to issue $8,000 for the extension of the sewerage system.

Hartington, Neb.—The construction of a complete sewerage system is contemplated.

Carrollton, Ill.—Plans have been prepared for constructing a sewerage system.

Nevada, Ia.—The construction of a sanitary sewerage system is contemplated.

Enderlin, N. D.—The construction of a sewerage system is contemplated at a cost of $25,000.

Laurel, Mont.—The question of constructing a sewerage system is under consideration.

Tulare, Cal.—Council has under consideration the construction of a sewerage system.

Des Moines, Ia.—The estimated cost of the proposed sewer in Woodland ave. is $48,215.

Porterville, Cal.—The question of constructing a sewerage system is under consideration.

Rochester, Minn.—The construction of a sewer in Division st., North Rochester, is contemplated.

Cody, Wyo.—The question of issuing bonds for constructing a sewerage system is being discussed.

Arlington, O.—The state bd. of health favors the construction of a sewage disposal plant here.

Waterloo, Ia.—About $75,000 will be expended for the construction of the west end sewer extension.

Sandusky, Mich.—The construction of a sewerage system is contemplated. Fred J. Benedict, cy. clk.

Salina, Kan.—The question of installing a septic tank for the sewerage system is under consideration.

Chandler, Okla.—The citizens voted, March 9, to issue $25,000 bonds for constructing a sewerage system.

Carthage, Mo.—The city council has under consideration plans for establishing new sewer dist. No. 8.

Twin Falls, Ida.—This city will vote on a proposition to issue $5,000 bonds for constructing a trunk sewer.

Indiana, Pa.—Bids will probably be received in June for constructing a sewage disposal plant. R. M. Mullen, engr.

Pittsburg, Pa.—The municipal authorities have under consideration the project of constructing a double sewerage system.

Vincennes, Ind.—Governor Marshall has signed a bill authorizing this city to construct a sewerage system.

Dubuque, Ia.—Plans are being prepared for constructing sewers in W. Locust, Washington and Jackson sts.

Albuquerque, N. M.—Bids will be called for soon for constructing a sewerage system. J. B. McManus, cy. clk.

Bellingham, Wash.—The city engineer has been directed to prepare plans and specifications for a sewer in block 141.

Cassopolis, Mich.—Preliminary surveys will be made for this village by Geo. S. Pierson, cy. engr. of Kalamazoo.

Red Wing, Minn.—Bids will be asked for in May or June for constructing concrete and pipe sewers. A. E. Rhame, cy. engr.

Providence, R. I.—Plans are being made for a new trunk sewer line in the Olneyville district, 1 mi. in length, at a cost of about $200,000.

Syracuse, N. Y.—A brick or concrete sewer in the southern section of the 17th ward is contemplated at a cost of $60,000. Henry C. Allen, cy. engr.

Hartford, Conn.—The East Side sewer committee has submitted a report providing for the construction of an intercepting sewer at a cost of $300,000.

Trenton, N. J.—An ordinance has been passed providing for the construction of sewers in Paul and Hillcrest aves. and Adeline and Poplar sts.

New Toronto, Ont.—Bids will probably be received in May for constructing a sewage disposal plant. J. Macpherson, of Islington, clk. and engr.

Indianapolis, Ind.—Bids will be received about April 20 for constructing a concrete, brick or concrete pipe sewer in Miller st., at a cost of about $40,000.

Dorrancetown, Pa.—Smith & Welles, of Wilkesbarre, are the engineers for the proposed trunk sewers. Bids have not yet been asked for the proposed work.

Stevens Point, Wis.—Bids will be asked about June 1 for constructing a sewer to include 3 blocks of 10-in. sewers. A. J. Cunneon, prest. B. P. W., 453 Main st.

Camden, Ark.—The construction of a new sewerage system in the western part of this city, creating sewer dist. No. 4, is contemplated. E. H. Carson, mayor.

Sioux City, Ia.—The city engineer has been directed to ask for bids for constructing storm sewers in Smith's Villa, and for the extension of the W. 14th st. storm sewer.

Culiacan (Sinaloa), Mex.—Plans for a modern sewer and drainage system for this city are being made by Olmstead & Gillelen, cons. engrs., 607 Wright & Callender Bldg., Los Angeles, Cal.

Marshall, Ill.—Bids will be received about April 1 for constructing a sewerage system in the West Side to include 15,000 feet of 10 to 24-in. pipe sewer. C. H. Burdunn, cy. engr.

Phœnix, Ariz.—Estimates have been prepared for duplicating the present privately owned sewer system, and for extensions covering the residence districts. O. A. Tierney, cy. engr.

Salina, Kan.—Special.—P. G. Wakenhut, cy. engr., says the construction of sewers is contemplated this summer as follows: 5,537 ft. 10, 290 ft. 21, and 623 ft. of 18-in. sewer.

Crookston, Minn.—New bids will be received in June for constructing a sewerage system in Alexander st. and River and Summit aves. J. D. McPhee, mayor; J. E. Carroll, cy. engr.

Belleville, Ill.—Bids will be received about April 15 for constructing a sewerage system in Irish Pond district, to include 1 mi. of 12 to 24-in. vitrified pipe sewer. F. Deutschmann, cy. engr.

Dallas, Tex.—Upon the recommendation of Mayor Hay, Commissioners Sullivan, Doran and Seay have been appointed a board of commissioners to ascertain the best method of sewage disposal for this city.

Austin, Tex.—Bids will probably be received in June or July for constructing a concrete sewer. G. S. Iredell, cy. engr.

Grand Rapids, Mich.—Bids will be received about April 1 for constructing crock tile sewers. L. W. Anderson, cy. engr.

Kendallville, Ind.—The construction of glazed pipe sewers in N. State st. is contemplated. Wm. P. Myers, cy. clk.

Dubuque, Ia.—Plans are being prepared for storm and sanitary sewers throughout this city, principally in the north end.

Jefferson, Wis.—Bids will be received soon for sewer extension to include 18 blocks of 24-in. tile sewer. W. S. Henry, mayor.

Columbia, Mo.—The city council has decided to construct an additional trunk sewer and septic tank. John S. Bicknell, cy. clk.

Salem, N. J.—The state board of health has notified city council that a sewage disposal plant must be erected and completed by 1913.

Tacoma, Wash.—Ordinances have been passed for constructing a sewer in dist. 172 and a conduit under Pacific ave. at S. 25th st.

Plymouth, Wis.—Bids will be received about May 1 for constructing about 16,000 ft. of sewer main. C. W. Jackson, cy. clk.

Las Animas, Colo.—The city engineer has been directed to prepare a plat and make surveys for the installation of a sewerage system.

Redding, Cal.—Special.—C. Stabler says machinery and tools may be purchased for sewer and cement work, as well as pipe, cement, etc.

Albert Lea, Minn.—Special.—Wm. Barneck, cy. engr., says the question of issuing $26,000 trunk sewer bonds will be voted on April 6.

Oxford, Ind.—Plans and specifications have been authorized and bids will be asked for constructing an extensive sewerage system here.

Aurora, Ill.—Bids will be received in April for constructing sewers in the southern portion of this city. M. J. Tarble, cy. engr.

Medina, N. Y.—The village trustees have decided to construct the proposed new sewer system on the west side. D. D. Holdredge, prest. sewer comn.

Kingston, N. C.—This city has under consideration the issue of $75,000 bonds for the extension of the sewerage system and other improvements.

Baltimore, Md.—Plans have been completed for constructing a sewerage system for the Colonial Park Estates Co. L. G. Turner, 208 Union Trust Bldg.

Seattle, Wash.—Ordinances have been passed providing for the construction of sewers in E. Boston st. and Linden ave. Plans have been approved for constructing a system of sewers on Queen Anne hill, at a cost of $140,000.

Winchester, Va.—Detailed plans and specifications prepared by N. Wilson Davis, of Harrisonburg, Va., have been accepted by common council for constructing a modern sewerage system. About 8 mis. of pipe sewers will be constructed.

Alliance, Neb.—Special.—J. P. Hazard, co. surv., says this city has voted to issue $45,000 bonds for constructing sever mains and a disposal plant. Plans are not yet fully developed, but the effluent will probably be used to sub-irrigate about 40 acres of truck farm.

Perth Amboy, N. J.—The state sewerage commission has approved the plans of this city for a trunk sewer system to empty into the Raritan river at the foot of Sheridan st. The system will consist of sewers ranging from 6-in. pipe to a tunnel of brick and concrete 7 ft. in diameter, and will cost $80,000.

Spokane, Wash.—Plans and specifications have been prepared for constructing a sewer in the 1st ward, to be known as the 1st ward sub-trunk sewer dist. No. 12. Plans and specifications have also been prepared for constructing sewers in an alley and one to be known as the 5th ward sewer dist. No. 5. Plans and specifications have been authorized for constructing a conduit to carry off the surface water in the eastern part of the city, and a lateral sewer in 16th ave.

Toronto, Ont.—J. D. Watson, of Birmingham, England, and Rudolph Hering, of New York City, have submitted their report on the proposed sewage disposal question, and recommend the following: That the sewage disposal plant be constructed on Morley ave. site, and that the tanks be located close to the shore line, south of Eastern ave.; that sewage be made to issue from a number of small openings in the outfall sewer to facilitate a high degree of dispersion and dilution; that the intercepting sewer be constructed of Portland cement concrete with a vitrified brick invert; that the proposal to establish a filtration plant be adopted; that the plans of the sewage disposal works as amended be adopted. C. H. Rust, cy. engr.

Madisonville, Ky.—A system of sanitary sewers is contemplated. Jas. L. Brown, cy. clk.

Moultrie, Ga.—This city contemplates the construction of about 7 mis. of 8, 10 and 12-in. sewer pipe.

Raymond, Miss.—Plans will be prepared for the purification of the sewage for the county court house.

Brockton, Mass.—The construction of 3 to 5 mis. of pipe sewers is contemplated. Chas. H. Felton, cy. engr.

Buffalo, N. Y.—The mayor has approved the bill providing for an appropriation of $150,000 for work on the Swan st. sewer.

North Andover, Mass.—Voted to authorize the issue of bonds for constructing the west side sewerage system. Joseph H. Duncan, town clk.

Collingwood, N. J.—This town has decided to construct a new sewage disposal plant and filter beds and extend the pipe line about 3 mis.

CONTRACTS TO BE LET.

Cedartown, Ga.—Bids are asked until April 6 for constructing 2 mis. of sewers. J. B. Lacy, st. comr.

Muskegon, Mich.—Bids are asked until April 5 for constructing sanitary sewers. S. S. Evans, cy. engr.

Fort Francis, Ont.—Bids are asked until April 15 for constructing a sewerage system. W. H. Eliot, twn clk.

Madison, Ind.—Bids are asked until April 1 for constructing 2,200 ft. of 18 to 24-in. sewer. G. F. Harper, clk. B. P. W.

Auburn, N. Y.—Bids are asked until April 20 for constructing sewers and appurtenances. W. Thos. Wooley, cy. engr.

Watertown, Wis.—Bids are asked until about May 10 for constructing 12,000 ft. of 8 to 24-in. tile sewer. Arnold Kroeft, cy. engr.

Monticello, Ind.—Bids are asked until April 7 for constructing the Holmes et al. ditch. David W. Rotruck, drainage comr.

Ossining, N. Y.—Bids are asked until April 6 for constructing 2 sections of the sewerage system. R. A. Ward, vil. clk.

Port Townsend, Wash.—Bids are asked until April 6 for constructing 8 2-3 mis. of sewer and fittings. Geo. Anderson, cy. clk.

Birmingham, Ala.—Bids are asked until April 21 for constructing 7 sections of brick and concrete sewers. Maury Nicholson, cy. engr.

Millville, N. J.—Bids are asked until 7:30 P. M., April 2, for constructing a sewage disposal plant. Chas. B. Neal, chmn. sewer comn.

La Crosse, Wis.—Bids are asked until April 15 for constructing circular pipe sewers in sections A, B and C. H. J. Beckwith, chmn. comrs. pub. wks.

Sioux City, Ia.—Bids are asked until April 13 for constructing reinforced concrete diverting conduit about 2,600 ft. in length for Bacon creek. A. A. Smith, cy. clk.

Silvis, Ill.—Sealed bids are asked until 2:30 P. M., April 3, for constructing certain sewers with manholes, lampholes, T's and Y's, etc. Richard Walsh, prest. bd. local impvts.

Bellingham, Wash.—Bids are asked until April 5 for constructing a sewer in trunk sewer dist. No. 9, and for constructing a concrete tunnel sewer up Whatcom creek. Cy. comptroller.

Columbus, O.—Bids are asked until July 15 for constructing a concrete retaining wall around the settling basins of the sewage purification works adjacent to the Scioto river. Edward W. Hirsch, secy. B. P. W.

Flora, Ill.—Bids will be received about April 15 or May 1 for constructing a gravity sewer, requiring 3,934 ft. 18, 2,571 ft. 16-in., 3,196 ft. of 12-in. pipe sewers, 22 brick and concrete manholes and c. i. covers. C. S. Cunningham, chmn. B. P. W.

Baltimore, Md.—Sealed bids are asked until April 7 for constructing sewers as follows: Contract No. 38—16,200 lin. ft. 6-in. house connection; 29,500 ft. 8-in. and 2,300 ft. 10 to 15-in. pipe sewer. Contract No. 29—13,500 ft. 6-in. house connections; 19,600 ft. 8-in. and 4,200 ftt. 10 to 20-in. pipe sewers. Peter Leary, Jr., chmn. sewerage comrs.

Oshkosh, Wis.—Bids are asked until April 17 for constructing sewers in several streets. B. P. W.

Julesburg, Colo.—Bids are asked until April 3 for constructing a sanitary sewer. Mark Burke, mayor.

Circleville, O.—Bids are asked until April 15 for constructing a disposal plant at the Infirmary. Co. comrs.

Port Townsend, Was.—Bids are asked until April 6 for constructing 8 2-3 mls. of sewers. Geo. Anderson, cy. clk.

Seattle, Wash.—Bids are asked until April 9 for constructing sewers in Thorndyke ave. and other streets. B. P. W.

McAlester, Okla.—Bids are asked until April 15 for constructing sanitary and storm sewers. J. Phelan, cy. engr.

Youngstown, O.—Bids are asked until April 2 for constructing a sewer in Belleview ave. W. H. McMillin, clk. B. P. S.

Indianapolis, Ind.—Bids are asked until April 20 for constructing a brick or pipe sewer in Miller st. Blaine H. Miller, cy. engr.

Dunmore, Pa.—Bids are asked until April 6 for constructing sewers in section O of the 2d district. Chas. S. Genter, secy. boro. coun.

College Hill (Cincinnati P. O.), O.—Bids are asked until April 12 for constructing a sewage disposal plant and appurtenances. F. R. Strong, vil. clk.

Williamsport, Pa.—Bids are asked until April 2 for constructing a storm sewer and 3 house sewers. Oliver H. Young, chmn. highway and sewer com.; J. J. Galbraith, cy. clk.

Washington, D. C.—Bids are asked until April 26 for constructing the Luzon ave. trunk sewer and a sewer in the valley north of R st. H. B. F. MacFarland, chmn. dist. comrs.

CONTRACTS AWARDED.

Bellingham, Wash.—J. M. Ager was awarded the contract for constructing a sewer in an alley, for $1,130.65.

Narragansett, R. I.—The contract for constructing sewers was awarded to John Bristow, of this city, for $30,000.

Great Falls, Mont.—The contract for constructing a lateral sewer in 7th alley was awarded to Gus Nilson, for $2,445.

Pueblo, Colo.—James Cavin was awarded the contract for constructing 1,443 ft. of 8-in. sanitary sewer at 61 cts. a lin. ft.

Chicago, Ill.—The contract for cleaning 2,000 ft. of the Lawrence ave. sewer was awarded to John P. Dougherty, at $4.90 per ft.

Spokane, Wash.—Sewer contracts have been awarded as follows: Huron st., P. L. Langan, $5,859; in alley, James C. Broad, $3,665.

Denton, Tex.—The contract for constructing a sewerage system was awarded to Trueheart & Jackson, of San Antonio, for $23,125.

Grundy Center, Ia.—The contract for constructing 4 mls. of sewers was awarded to M. Tschirgi & Sons, of Dubuque, Ia., for $15,554.55.

Wagoner, Okla.—The contract for constructing a sewerage system was awarded to W. W. Cook & Son, of Junction City, Kan., for $22,000.

Grand Fork, N. D.—The contract for constructing a brick sewer in DeMers ave. was awarded, March 16, to P. McDonnell, of Duluth, for $69,478.05.

Louisville, Ky.—The contract for constructing a sewer in 12th st., contract No. 25, was awarded to the T. J. O'Connell Co., of Baltimore, for about $80,000.

Emporia, Kan.—The contract for constructing a storm sewer through Humboldt Park was awarded to Brown & Ferren; lateral sewer between Sylva and East sts., Lang & Ferren.

Avalon, N. J.—The Atlantic Construction & Supply Co., of Atlantic City, was awarded the contract, March 5, for constructing about 7,400 ft. of terra cotta sewer, for $3,500.

New London, Conn.—The contract for constructing the outfall sewer, settling basin and tile connections in State st. was awarded to the T. A. Scott Co., of this city, for $11,804.

Baltimore, Md.—The contract for constructing lateral sanitary sewers, to become a part of the city's general sewerage system, was awarded to T. Wilson Riley, of this city, for $66,544.25.

Nashville, Tenn.—The contract for furnishing pipe for the sewer to be constructed in West Nashville was awarded to Howard Motz & Co., of this city, at $18.97 a ton. The contract for special castings was awarded to J. H. Fall & Co., at $55 a ton.

Salt Lake City, Utah—Special—L. C. Kelsey, cy. engr., advises us that the contract for constructing a reinforced concrete conduit and culvert at Twelfth South st. was awarded, Feb. 26, to Shea & Anderson, for $2,163.50. This firm also received the contract for constructing a reinforced concrete conduit north of Mill creek, for $7,437.79. The contract for constructing the North Temple st. aqueduct was awarded to Davis & Heuser, for $48,-252.

New York City—Bids for constructing sewers and appurtenances in W. 127th st. were received March 10 as follows: Thos. A. Reilley, $18,945; Joseph Moore, $25,-855; Michael Marrone, $20,635; Bart Dunn, $24,043; Walter J. Ford, $24,692; Smith & Fitzgerald, $29,006; W. J. Brennan, $24,134; Briggs & McLaughlin, $27,-212; Haggerty Contracting Co., $19,576.

Asbury Park, N. J.—Bids were received March 1 for constructing sewage disposal works and the connection therewith of the city sewers and the sea outlet pipes as follows: United Paving Co., Atlantic City,

$27,273; McHarg-Barton Co., New York, N. Y., $28,300; North-Eastern Constr. Co., New York, N. Y., $32,092; B. G. Coon Constr. Co., Wilkesbarre, Pa., $32,555; Merrill Ruckgabor Co., New York, N. Y., $34,200; Francis J. Boas, 14 S. Broad st., Philadelphia, Pa., $34,500; B. F. Sweeten & Son, Camden, $43,044. Wm. C. Burroughs, cy. clk. (City Wastes Disposal Co., engrs., 150 5th ave., New York, N. Y.) The contract was awarded to the United Paving Co., of Atlantic City, for $27,272.

WATER WORKS.

Jersey City, N. J.—This city authorized, March 5, the consummation of the purchase of the water plant at Boonton.

Cleveland, Tenn.—This city voted, March 20, to issue $60,000, which will go towards the purchase of the water-works plant and improving it.

Knoxville, Tenn.—A suit will probably be filed in the interest of a number of water consumers within this city, seeking to enforce the payment of rebates to water consumers.

Follansbee, W. Va.—The Follansbee Water & Light Co. has been incorporated by Thomas J. Mahan, Frank B. Mahan, H. B. Mahan, B. H. Bristle, C. B. Crawford, of Follansbee, and H. C. Meyer, of Wellsburg.

CONTEMPLATED WORK.

Texahoma, Okla.—A water-works system is contemplated.

Lexington, S. C.—A water-works system is proposed .

Laurel, Mont.—The construction of a water-works system is contemplated.

Gallatin, Mo.—Voted to issue bonds for the extension of the water-works system.

Woodward, Ia.—Voted to issue bonds for constructing a water-works system.

Hazlehurst, Ga.—Voted to issue bonds for constructing a water-works system.

Kempton, Ill.—This city contemplates the construction of a water-works system.

Gregory, S. D.—Voted to issue bonds for the extension of the water-works system.

Coleman, Mich.—This village contemplates the construction of a water-works system.

Medway, Mass.—A plan has been adopted for the proposed $50,000 water-works scheme.

Auburn, Neb.—Voted to issue bonds for constructing a water-works and sewerage system.

Rhodes, Ia.—This city has voted to issue bonds for constructing a water-works system.

Coldwater, Mich.—The water-works system will be improved. W. W. Frederick, supt.

Jacksonville, Ala.—Voted to issue bonds for installing a municipal water-works system.

Uniontown, Ky.—Surveys and estimates have been made for a complete water-works system here.

Fort Erie, Ont.—The question of installing a water-works system is under consideration.

Zanesville, O.—A system for clarifying the water supply of this city has been recommended.

Cody, Wyo.—This city is talking of issuing bonds for the construction of a water-works system.

Glasgow, Mo.—Voted to issue bonds for the extension and improvement of the water-works system.

Dallas, Tex.—Will vote April 6 on the issue of bonds for constructing a water-works improvements.

South Bend, Ind.—(Special.) Frederick Schafer, 1005 S. Lafayette st., desires to purchase water-works machinery.

Lynn, Mass.—The water board has submitted its report on the plans for a higher pressure water service for this city.

Elko, Nev.—(Special). J. D. McFarlane advises us that machinery and tools for water works may be purchased.

Fallon, Nev.—(Special). E. P. Osgood, cy. engr., says plans for water works are being made. Estimated cost, $40,000.

Toronto, Ont.—Specifications have been completed for the proposed filtration plant at the Island. C. H. Rust, cy. engr.

Punxsutawney, Pa.—The Punxsutawney Water Co. contemplates the installation of a gravity filter plant. Chas. Rutz, supt.

Cincinnati, O.—The board of public service will be asked to authorize an issue of $100,000 bonds for laying additional water mains.

Anderson, Ind.—(Special).—The Anderson Water Works Co., 17 W. 9th st., is in the market for c. i. water pipe and fittings.

Richmond, Va.—In his annual message the mayor recommends the erection of a water tower or elevated tank near 11th and Gary sts.

Shrewsbury, Mass.—The question of securing an adequate water supply is being considered. H. A. Maynard, R. E. Allen and H. A. Cook, water comrs.

Ogden, Utah.—Bids will probably be asked soon for constructing an earthen distributing reservoir for the water-works department. A. F. Parker, cy. engr.

Carthage, Mo.—The board of public works began formulating, March 15, plans for constructing the proposed municipal water-works system.

Saginaw, Mich.—The annual report of the water board again urges the desirability of securing a supply of clean, wholesome water for this city.

Elgin, Ill.—The water commissioners urge, as further improvement of the water supply and system of this city, additional wells, the installation of water meters, etc.

Medina, N. Y.—Voted to expend not more than $3,000 annually for the next three years in addition to the $2,000 allowed by law for improving and extending the water system.

Washington, D. C.—Surveys have been completed and preliminary designs and estimates are being prepared for the approved project of increasing the water supply of the District of Columbia.

Walkerville, Md.—A company has been formed by Dr. John Nicodemus, B. I. Jamison, Franklin D. Harshman, Lincoln D. Dinterman and others for the purpose of constructing a water works system.

Greeley, Colo.—Maps, plans and specifications have been filed with the county clerk for an irrigation system and reservoir, the water to be secured from the South Platte and St. Vrain rivers.

Birmingham, Ala.—The proposition to appropriate $5,000 to make a survey for the purpose of bringing water from the Warrior river, for the proposed municipal water-works system, has been referred to a committee.

Lovell, Wyo.—(Special). William T. Lovell, Box 700, is in the market for 14,000-ft. of 6 and 4-in. pipe, 150-lbs. pressure; 40,000 and 60,000-gal. elevated tanks, engine-driven duplex or triplex pump; valves, hydrants, etc.

Bellingham, Wash.—Plans and specifications for the new 18-in. water pipe line to extend from a point near Bay View Cemetery st., were submitted to the water board, March 5, by the city engineer. The line will be about 5,500-ft. long.

Niagara Falls, N. Y.—Voted, March 10, to expend $717,000 for a pure water sup-

ply, the work to include the construction of a new pumping station, laying an intake pipe 2,100-ft. into the river, building an intake crib and installing filters.

Vancouver, B. C.—The Canadian Agency of London has made a proposition to the municipalities of South Vancouver, Point Grey, Richmond and Burnaby for constructing a combined water-works system through these districts for the joint use of the four municipalities.

CONTRACTS TO BE LET.

Willow, Ky.—Bids are asked until April 23 for constructing 3 cisterns. U. S. Engrg. Office, Cincinnati.

Jackson, Miss.—Bids are asked until April 6 for furnishing a pumping engine. Hamilton Johnson, cy. engr.

Swanton, O.—Bids are asked until April 6 for constructing a water-works system. Wm. B. Elwell, vil. clk.

Canistota, S. D.—Bids are asked until April 6 for constructing a water-works system. J. A. McKinnon, town clk.

Kimball, Neb.—Bids are asked until April 5 for constructing a water-works system. Will J. Davis, vil. clk.

Shirley, Ind.—Bids are asked until April 15 for constructing a water-works system. B. L. Burnett, prest. B. P. W.

Swanton, O.—Bids are asked until April 6 for constructing a water-works system. Wm. B. Elwell, secy. trus. bd. pub. affairs.

Ft. Crook, Neb.—Bids are asked until April 12 for sinking a 10-in. tubular deep well. Capt. Jos. F. Gohn, contr. Q. M.

Everett, Mass.—Bids are asked until April 2 for furnishing water pipe and special castings. Wm. J. Brickley, chmn. B. P. W.

St. Henry, O.—Bids are asked until April 20 for constructing a water-works system. Wm. F. Schweiternan, clk. bd. pub. affairs.

Jackson, Miss.—Bids are asked until April 6 for furnishing a high-duty water-works pumping engine. Hamilton Johnson, cy. engr.

Salem, Ind.—Bids are asked until April 5 for constructing, building and extending the water-works system. Eugene Routh, town clk.

Harlem, Mont.—Bids are asked until April 15 for constructing a water system at Ft. Belknap Agency. Comr. Indian Affairs, Washington, D. C.

New Orleans, La.—Bids are asked until April 6 for furnishing water meters and meter boxes. George G. Earl, supt. sewer and water bd.

Petaluma, Cal.—Bids are asked until May 5 for furnishing and installing a pumping machine for salt water high pressure system. Cy. clk.

Toledo, O.—Bids are asked until April 8 for furnishing iron pipe, specials, valves, sluice gates, etc. Reynold Voit, secy. B. P. S.

New York City—Bids are asked until April 16 for constructing sections 17 and 18 of the Catskill aqueduct. John A. Bensel, prest. bd. water sup.

Bayonne, N. J.—Bids are asked until April 6 for water extension No. 584, requiring about 40 tons of 6 to 8-in. c. i. pipe and 32 hydrants, etc. W. C. Hamilton, cy. clk.

Greenville, Tex.—Bids are asked until April 6 for installing a compound condensing pumping engine, a surface condenser, and other appliances. W. A. Frazer, cy. clk.

Richland Center, Wis.—Bids are asked until April 9 for furnishing and laying 5,000 ft. of 8 and 10-in. c. i. pipe, special castings, valves and hydrants. R. Sutton, cy. clk.

McPherson, Kan.—Bids are asked until April 20 for furnishing 6,000 ft. 6-in. and 6,400 ft. 4-in. c. i. pipe, 9,000 lbs. lead, 250 lbs. hemp, and 15 hydrants. Water and electricity dept.

Weyburn, Sask.—Bids are asked until April 7 for work in connection with the water works, as follows: Pipe-laying, water tower, c. i. pipes, fire hydrants and valves. Samuel Murray, secy.-treas.

Eldora, Ia.—Bids are asked until April 12 for furnishing and installing complete deep well power pump head, open beater and purifier, and a steam boiler feed pump. L. F. Brown, chmn. w. w. com.

Rome, N. Y.—Bids are asked until April 21 for laying about 28,553 ft. 30-in., 2,025 ft. 24-in. and 780 ft. 20-in. c. i. pipe, valves, hydrants, etc. Harvey S. Bedell, chmn. bd. water and sewer comrs.

Platteville, Wis.—Bids are asked until April 2 for constructing a deep well pumping system, using either air lift, crank and fly-wheel deep well pumping engines, or a deep well turbine pump. Cy. clk.

Jacksonville, Fla.—Bids are asked until 3 P. M., April 5, for furnishing 2 motor-driven centrifugal pumps, 2,000 gals. each, and alternate bids each on 2 pumps of 2,500 gals. each. Bron. H. Barnett, prest. w. w. trus.

New York City—Sealed bids are asked until April 6 for constructing 14,100 ft. and 15,500 ft., respectively, of plain concrete conduit known as cut-and-cover aqueduct 17 ft. high by 17½ ft. wide inside. John A. Bensel, comr. water sup.

Cheyenne, Wyo.—Sealed bids are asked until April 5 for extending the water works system, requiring 10,027 tons of hub spigot c. i. pipe, valves and fittings, etc.; 200 tons of soft pig lead; 15 tons of jute oakum. J. D. Wright, cy. clk.

Lake Village, Ark.—Bids are asked until April 6 for constructing a brick power house and pump pit, and furnishing a pump, gasoline engine, steel tank and tower, and laying 3 mis. of 4 to 8-in. mains, hydrants, valves, etc. Lund & Hill, engrs., Little Rock.

New York City—Bids are asked until April 8 for constructing a portion of the Catskill Aqueduct, consisting of Millwood, Sarles, Harlem R. R., Pleasantville and Reynoldsville tunnels, Putnam siphon and Millwood-South, Sarles and Pleasantville cut-and-cover, being contract 46. John A. Bensel, comr. water sup.

CONTRACTS AWARDED.

Richmond, Va.—The contract for constructing a settling basin flume was awarded to the Piedmont Construction Co., of Atlanta, Ga.

Scottsbluff, Neb.—The contract for constructing a water works system has been awarded to the Katz-Craig Construction Co., of Omaha, for $27,660.

Salt Lake City, Utah—The contract for constructing a large aqueduct in N. Temple st. was awarded to Davis & Heuser, of Hutchinson, Kan., for $48,252.

Fort Getty, R. I.—The contract for constructing a water works system was awarded to Darling & Slade, 56 N. Main st., Fall River, Mass., for $5,459.

Baltimore, Md.—The contract for constructing 11 mis. of pipe, to run from the sewers to the curb line, was awarded to T. Wallace Reilly, for $66,000.

Inglewood (Denver P. O.), Colo.—The contract for installing a water works system was awarded to the Consolidated Engineering Co., of Denver.

East Jordan, Mich.—The contract for constructing a water works system in this city has been awarded to W. B. Caldwell, of Traverse City, for about $20,000.

International Falls, Minn.—The contract for constructing a water works system was awarded to the Cook Construction Co., of Des Moines, Ia., for $14,382.

Waukesha, Wis.—The contract for furnishing about 18,000 ft. of c. i. pipe was awarded to the Lynchburg Foundry Co., of Lynchburg, Va., for about $10,000.

Wichita, Kan.—The contract for constructing a municipal water works system was awarded, March 15, to the Municipal Construction Co., of Denver, Colo., for $849,754.

Rock Island, Ill.—The contract for constructing the 6th ward water main and sewer improvement was awarded, March 18, to F. E. Kaninski, of Watertown, Wis., for $34,177.35.

New York City—The contract for constructing the Walkill Valley siphon tunnel for the Catskill aqueduct will probably be awarded to the Degnon Contracting Co., for $4,982,726.

Rock Island, Ill.—The contract for constructing a water works filter plant was awarded to Thomas Lightbody, of Youngstown, and Wm. Henderson, of Warren, O., for about $130,000.

Fort Assiniboine, Mont.—The Canton Boiler and Engineering Co., of Canton, O., has been awarded the contract for furnishing a 1,000,000-gal. steel tank and trestle, for $12,327.

Lynchburg, Va.—The contract for erecting 2 reinforced concrete reservoirs and laying mains to supply water to Thomas F. Ryan's Nelson county estate was awarded to Lane Bros. for about $20,000.

Duluth, Minn.—The contract for a double-acting triplex pump for the new station of the middle water system at 15th ave., East and 6th st. was awarded to the General Electric Co., of Schenectady, N. Y., for $6,400.

Toledo, O.—The contract for constructing a conduit under Delaware river to bring the pure water down from the filtration plant was awarded, March 15, to M. Rabbitt & Sons, The Nasby, Toledo, for $18,512, exclusive of the pipe.

Syracuse, N. Y.—The contract for furnishing 304 tons of 12, 8 and 6-in. pipe was awarded to the U. S. Cast Pipe and Foundry Co., 71 Broadway, New York City, at $22.70 per ton, and 40,000 lbs. of specials, at 2½ cts. per lb.; total, $7,901.

Minot, N. D.—Special.—The contract for constructing about 11 mis. of water mains was awarded to James J. Kennedy, of Fargo, N. D., for $107,502.66; constructing pumping station and filtration plant, $44,400; building 100,000-gal. tank, $3,500; total $155,402.66.

Branchville, N. J.—The contract for constructing a municipal water works system was awarded, March 12, to Fritts & Partridge, of Dover, conditionally, the company's bid being $27,707.50 using iron supply pipe, and $27,083.25 using wood supply pipe. Council gave itself two months in which to secure the right of way, and if it found that the cost of construction, together with engineer Sexton's fees and the cost of the right of way, are less than the authorized bond issue, work will proceed at once. If otherwise, the project will be abandoned temporarily and bids for the construction readvertised.

BRIDGES.

Cleveland, O.—Bids are asked until April 7 for constructing bridge work. Wm. F. Black, co. clk.

Bryan, O.—Sealed bids are asked until April 6 for constructing a number of bridges. Co. audt.

New Hampton, Ia.—Bids are asked until April 6 for constructing concrete bridges. F. N. Lentz, co. audt.

La Moure, N. D.—Bids are asked until April 6 for building steel and wood bridges. E. W. Field, co. audt.

Laporte, Ind.—Bids are asked until April 6 for Spahr bridge and abutments in Hanna twp. Co. comrs.

LaGrange, Ind.—Bids are asked until April 6 for building various bridges. B. D. Weaver, co. audt.

Dayton, O.—Bids are asked until April 8 for constructing a bridge over Wolf creek.

Moston, O.—Bids are asked until April 5 for constructing a concrete arch culvert. Co. audt., Batavia, O.

Greenville, Miss.—Bids are asked until April 5 for constructing a number of bridges. W. W. Miller, co. clk.

Marseilles, Ill.—Bids are asked until April 5 for building 2 reinforced concrete bridges. Daniel T. Hines, cy. clk.

Bryan, O.—Bids are asked until April 16 for constructing several reinforced concrete bridges. R. H. Weaver, co. audt.

Marietta, O.—Bids are asked until April 20 for constructing various bridges, abutments and other work. Co. comrs.

Ellijay, Ga.—Bids are asked until April 5 for a double-track steel bridge across Ellijay river. T. H. Tabor, ordinary.

Starke, Fla.—Bids are asked until April 5 for building a steel bridge over Iew river. C. L. Peek, chmn. bd. co. comrs.

Graham, N. C.—Bids are asked until April 5 for building 14 short reinforced concrete bridges. R. L. Holt, chmn. co. comrs.

Colfax, Wash.—Bids are asked until April 5 for building a steel bridge over Pine creek, near Malden. Wm. M. Duncan, co. audt.

Washington C. H., O.—Bids are asked until April 6 for constructing bridges in various parts of the county. H. D. Chaffin, co. audt.

Winnipeg, Man.—Bids are asked until April 8 for constructing a steel bridge over Red river. P. E. Ryan, secy. Transcontinental Ry. Comn.

Isola, Miss.—Bids are asked until April 5 for constructing a steel bridge over Jackson bayou here. W. W. Miller, clk. co. supjvrs.

Manhattan, Kan.—Bids are asked until April 8 for building a steel bridge over Fancy creek, Center twp. Geo. H. Hungerford, co. clk.

Glen Oak, Ont.—Bids are asked until April 5 for building a reinforced concrete bridge at Caradoc. C. H. Lockwood, twp. clk., Mt. Bridges.

Camden, N. J.—Bids are asked until April 3 for constructing a reinforced concrete arch bridge over Pesauken creek. J. J. Albertson, co. engr.

Fredericton, N. B.—Bids are asked until April 25 for constructing 4 metal spans, each 260 ft. long, pin connection. John Morrissey, dept. pub. wks.

Magnolia, Miss.—Bids are asked until April 5 for building a bridge over Bogue Chitto river, and one over Tangipahoa. W. C. Vaught, clk. co. supvrs.

Watertown, Wis.—Bids are asked until April 5 for constructing a reinforced concrete girder bridge and abutments over Siver creek at Spaulding st. B. P. W.

Harrisonburg, La.—Bids are asked until April 5 for building a steel bridge at Bushley Bay, and for repairing a bridge. H. W. Bethard, clk. police jury.

Savannah, Ga.—Bids are asked until May 3 for building a reinforced concrete lock and bridge, Buckhalter Creek outlet. G. Reuben Butler, clk. co. comrs.

Camden, N. J.—Bids are asked until April 12 for building a concrete highway bridge over Cooper's creek, and for rebuilding a bridge. Fred W. George, clk. bd. freeholders.

Slingersland, N. Y.—Bids are asked until April 14 for constructing a bridge over

the Normanskill creek, on the New Scotland plank road. Geo. J. Coughtry, town clk., Bethlehem.

Greenwood, S. C.—The contract for replacing the Watts steel bridge over Saluda river, between Laurens and this city, was awarded, March 28, to the Southern Highway Bridge Co., of this city. The contract for erecting the Smith's bridge over the same river was awarded to the Roanoke Bridge Co., of Virginia.

Youngstown, O.—Bids are asked until April 12 for constructing a masonry arch bridge over Bear's Den in Youngstown twp., and abutments and reinforced concrete floor for bridge on Struthers and Lowellville road in Poland twp. Will B. Jones, co. oudt.

Omaha, Neb.—Plans have been submitted for 2 viaducts. One provides for a viaduct over the Missouri Pacific, Omaha & Union Pacific tracks on Locust st., east of 15th, and is to be 1,297 ft. long, built of steel, with 35-ft. driveway and 6-ft. walks on each side. The other plan provides for a viaduct over the Chicago Great Western tracks.

STREET LIGHTING.

Texahoma, Okla.—Voted to construct an electric light plant.

Chillicothe, Mo.—A municipal electric light plant is contemplated.

Lexington, S. C.—The question of an electric light plant is being agitated.

Orange, N. J.—The question of erecting a municipal lighting plant will be voted on May 4.

Rockaway, N. J.—The installation of a power plant at White Meadow is contemplated by Thomas H. Hoagland.

Provo, Utah—Special.—C. H. Decker advises us that he desires to purchase tools and machinery for an electric light plant.

Wilkesbarre, Pa.—Bids are asked until April 26 for constructing a power plant for the high school. A. E. Burnaford, prest. school bd.

Portales, N. Mex.—Plans have been completed for an electric light and water works plant. Burns & McDonnell, engrs., Kansas City, Mo.

Canton, O.—Bids are asked until April 12 for furnishing and installing a light plant in the county infirmary. M. W. Oberlin, co. audt.

Winnipeg, Man.—Bids are asked until April 15 for furnishing 2 testing transformers and control equipment. P. E. Cambridge, cy. electrician.

Fort Riley, Kan.—Bids are asked until April 2 for extensions to the lighting system, including 5 transformers. Capt. W. M. Whitman, Q. M.

San Jose, Cal.—Bids are asked until April 15 for lamp standards, etc., at U. S. postoffice. James Knox Taylor, supvr. arch., Washington, D. C.

Elkhart, Ind.—The contract for rebuilding the retorts and otherwise improving the plant of the Elkhart Gas Co. has been awarded to the Parker-Rudisell Mining & Mfg. Co.

Roanoke, Va.—The Craig Water Power Co. has been organized for the development of water power from Meadow and Johns creek, 20 mls. from here. A. L. Sibert, of this city, president.

Portsmouth, Va.—Bids are asked until April 13 for the purchase of a franchise and contract to light streets, public buildings, residences, business houses, etc. L. P. Slater, cy. clk.

Pine City, Minn.—Bids are asked until April 10 for building a power plant for Pine City Power Co. to develop 600 h. p.; concrete buildings and 8 mls. of transmission wire. J. M. Allen, engr. Pine City Power Co.

Des Moines, Ia.—The contract for installing an electric light and power plant for the Polk county court house and jail was awarded to the Erie City Iron Works, of Erie, Pa., for $10,750.

Duluth, Minn.—The contract for a double-acting triplex pump and accompanying appliances for the new station of the middle water system at 15th st. was awarded to the General Electric Co., of Schenectady, N. Y., for $6,400.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Rocky River, O.—This city has decided to spend $25,000 for constructing a reduction plant.

Knoxville, Tenn.—The city budget for 1909 contains an appropriation of $6,000 for street cleaning.

Lakewood, O.—Bids are asked until April 7 for collecting garbage for 1 yr. B. M. Cook, clk. bd. of health.

Richmond, Va.—Bids are asked until April 15 for building a 50-ton crematory or incinerator. Henry J. Cohn, supt. st. cleaning.

South Milwaukee, Wis.—Special.—Bids are asked until April 6 for a new sprinkler. Wm. P. Neil, cy. clk.; John Stuessi, st. comr.

Coraopolis, Pa.—Bids are asked until April 5 for the collection and disposal of garbage for 1 yr. J. J. Burry, chmn. bd. pub. safety com.

Providence, R. I.—Bids are asked until April 5 for constructing a dump scow to be used in conveying residue from the purification tanks at Field's Point. Walter F. Slade, comr. pub. wks.

Boston, Mass.—The contracts for street cleaning and sprinkling were awarded, March 10, as follows: For the Dorchester district, to John H. Winsloe, at $8,987 for cleaning the 80 miles of streets in this district between April 1 and Dec. 1, and $7.72 per day additional for street watering carts; for the West Roxbury district, about 78 miles of streets, to Charles J. Jacobs, 107 Terrace st., at $13,736 and $5 per day for watering carts.

PARKS.

Oklahoma City, Okla.—An elaborate system of parks and boulevards is contemplated.

Geneva, Ind.—A 15-acre tract of land has been presented to this city for a public park.

Aiken, S. C.—The park commission is beautifying Eustis Park, a large tract of land presented to this city for a park.

Bloomfield, N. J.—Town council authorized, March 9, the issue of bonds not to exceed $30,000 for park purposes.

New York City—Plans have been prepared for a park to be laid out near the Cathedral in Garden City, a suburb of Brooklyn.

FIRE APPARATUS.

Shanghai, China—Bids are asked until about April 15 for a petrol motor fire hose wagon. Fearon, Daniel & Co., 96 Wall st., New York City.

Bridgeton, N. J.—Bids are asked until April 6 for furnishing a hook and ladder wagon and a hose reel and 400 ft. of hose. Frank L. Hewitt, cy. clk.

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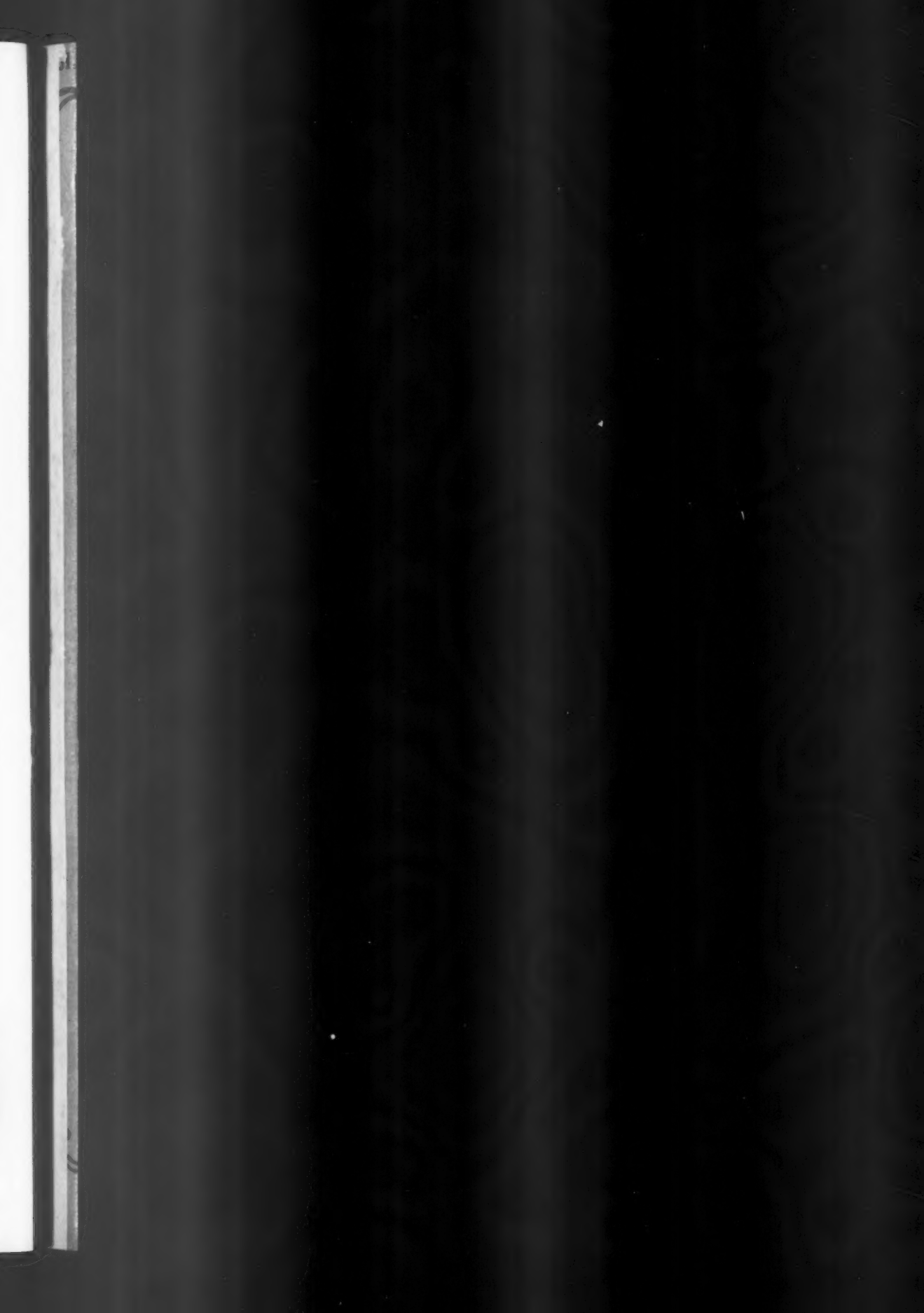
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